University of Massachusetts Amherst

School of Public Health and Health Sciences
Department of Environmental Health Sciences

March 22, 2022

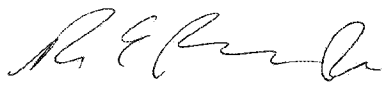
Dear Dr. Aldrin,

I enthusiastically endorse your project to the EPA, "Survey of Ethylene Oxide in Lake County, Illinois Using Best Testing Practices" that your group is submitting, and agree to support your research inquiries throughout the entirety of the project.

As you may recall, I am an associate Professor at the University of Massachusetts in the Department of Environmental Health Sciences. The work I would perform is external to my primary appointment, and is consistent with my University's policies on outside consultation and engagement. I hold a PhD in Atmospheric Chemistry from Georgia Tech, and a Master of Public Health in Environmental Health from Columbia University. My research is in exposure science, focused mainly on human exposures to airborne contaminants. I am an executive editor of the Journal of Exposure Science and Environmental Epidemiology, and provide national and international service as a member of the Global Air Pollution and Health Technical Advisory Group (GAPH-TAG) to the World Health Organization, and am a member of the CASAC panel on Ozone. I lead an active research lab, where our work is centered on collection of field measurements for various pollutants, and characterization of these results into meaningful conclusions, especially for those that can influence policies. Lastly, I am a skilled communicator of science to the general public, having conducted hundreds of media interviews across a range of air pollution-related news stories over the past 10-12 years.

With respect to your project, I am available for consultation at a flat rate of $150/hour, and expect to work with you about one day per month (annual total of 100 hours). I will provide your team with expertise and guidance on establishing a mobile sampling platform that can operate in urban environments, and in the presence of specific sources of ethylene oxide, and will assist your team in interpretation of collected results as they arrive. All datasets, and derived research products such as codes and interim datasets, will be furnished to your team. Lastly, I will assist your team to summarize your results to the EPA through descriptive statistics and graphical output, and provide broader engagement for the general public. I am also available for media interviews as needed to support your work.

I wish you the best of luck in your application!



Richard E Peltier, MPH, PhD
Associate Professor

175 Goessmann • 686 North Pleasant Street • Amherst, MA 01003-9303 • tel: 413.545.1317 • fax: 413.545.6536
Richard E Peltier, MPH, PhD rpeltier@umass.edu

JOHN C. ALDRIN

Address: Ex. 6 Personal Privacy (PP)

Phone: Ex. 6 Personal Privacy (PP)
E-mail:

Education

Northwestern University, *Evanston, IL* 60208
Theoretical and Applied Mechanics, Doctor of Philosophy, June 2001
Dissertation: Models and Classification Procedures for Ultrasonic Inspection of Holes for Fatigue Cracks (Prof. J. D. Achenbach - Major Professor)

Purdue University, *West Lafayette, IN* 47907
Mechanical Engineering, Master of Science, May 1996

Purdue University, *West Lafayette, IN* 47907
Mechanical Engineering, Bachelor of Science, May 1994, With Distinction

Work Experience

Computational Tools, *Gurnee, IL 60031*
Engineering Consultant, February 2001 to present

- Specialize in research and applications development services on nondestructive evaluation (NDE) modeling and simulation, data analysis, inverse methods and reliability assessment.
- As Visiting Scientist with AFRL/RXCA, developed strategy and conducted research on computational methods in NDE of aircraft structures and propulsion components.
- Performed research and development of models in ultrasonic and eddy current NDE.
- Developed algorithms with SAIC Ultra Image Int. for automated ultrasonic inspections for C-130 beam cap holes and C-130 hat section / rainbow fitting holes.
- Developed methods and performed demonstrations for model-assisted probability of detection (MAPOD) evaluation for NDE and structural health monitoring applications.
- Provided services to: USAF/AFRL, NASA, SAIC, iTi/Mistras, TRI/Austin, Victor Technologies, BP, Southern Research, Radiance Technologies, Intelligent Automation Inc., Vibrant Corp.
- Participate as member of NASA NESC TDT on Nondestructive Evaluation.

Northwestern University, Center for Quality Engineering, *Evanston, IL* 60208
Graduate Research Assistant, January 1998 – February 2001

- Developed a simulation of the scattering of an ultrasonic transducer signal by a C-141 weep hole
- Developed algorithm using neural networks to detect bottom and top cracks in weep holes.
- Designed and implemented PC software for automated ultrasonic inspection of weep holes.
- Developed models and ultrasonic inspection procedures for special holes cases: fluid filled cavity, cavity with elastic insert and stiffness interface, cavity with elastic coating.

Whirlpool Corporation, *Benton Harbor, MI* 49022
Project Engineer, May 1996 - December 1997

- Developed and implemented novel automatic washer spin dynamics test platform.
- Performed fundamental experimental studies on automatic washer suspension performance.
- Developed strategy and performed investigations for the application of sensors to washers.

Purdue University, Herrick Laboratories, *West Lafayette, IN* 47907
Graduate Research Assistant, January 1995 - May 1996

- Performed review of the state-of-the-art in vibration control systems.
- Developed analysis methodology and performed assessment of the most promising vibration control systems for application to automatic washer suspension design.
- Performed analytical investigations of adaptive passive automatic washer suspension concepts.

Publications

1. Aldrin, J. C., "The Human-Machine Interface (HMI) with NDE 4.0 Systems," *Handbook on Nondestructive Evaluation 4.0*, Meyendorf, N., Ida, N., Singh, R., Vrana, J. (Eds.), (2021) ISBN 978-3-030-73207-3.
2. Aldrin, J. C., Knopp, J., Sabbagh, H. A., "Bayesian Methods in Probability of Detection Estimation and Model-assisted Probability of Detection (MAPOD) Evaluation," Review of Progress in QNDE, Vol. 32, AIP Conf. Proc. 1511, pp.1733-1740, (2013).
3. Sabbagh, H. A., Murphy, R. K., Sabbagh, E. H., Aldrin, J. C., and Knopp, J. S., *Computational Electromagnetics and Model-Based Inversion - A Modern Paradigm for Eddy-Current Nondestructive Evaluation*, Springer, 2013.
4. Aldrin, J. C., Medina, E. A., Santiago, J., Lindgren, E. A., Buynak, C., Knopp, J., "Demonstration study for reliability assessment of SHM systems incorporating model-assisted probability of detection approach," *Review of Progress in QNDE*, Vol. 31, AIP Conf. Proc. 1430, pp.1543-1550, (2012).
5. Aldrin, J. C., Knopp, J. S., Blodgett, M. P., and Sabbagh, H. A., "Uncertainty Propagation in Eddy Current Inverse Problems", *Review of Progress in QNDE*, Vol. 30, AIP, pp. 631-638, (2011).
6. Aldrin, J. C., Medina, E. A., Lindgren, E. A., Buynak, C. F., Knopp, J. S., "Protocol for Reliability Assessment of Structural Health Monitoring Systems Incorporating Model-assisted Probability of Detection (MAPOD) Approach," Proceedings of the 8th International Workshop on Structural Health Monitoring, Ed. F.-K. Chang, Stanford, CA (September 13-15, 2011).
7. Aldrin, J. C., Blodgett, M. P., Lindgren, E. A., Steffes, G. J., and Knopp, J. S., "Scattering of obliquely incident shear waves from a cylindrical cavity", *Journ. Acoust Soc. America*, 129, pp. 3661-3675 (2011)
8. Aldrin, J. C. and Knopp, J. S., "Modeling and Simulation for Nondestructive Testing with Applications to Aerospace Structures", *Materials Evaluation*, Vol. 66, n 1, p. 53-59, (2008).
9. Aldrin, J. C., Kropas-Hughes, C. V., Knopp, J., Mandeville, J. R., Judd, D., Lindgren, E., "Advanced Echo-Dynamic Measures for the Characterization of Multiple Ultrasonic Signals in Aircraft Structures", *Insight – Journal of the British Institute of Non-Destructive Testing*, Vol. 48, n 3, pp. 144-148, (2006).
10. Aldrin, J., "Overview of Mathematical Modeling in Nondestructive Evaluation (NDE)," Nondestructive Testing Information Analysis Center, NT-SP-01-03, (2002).
11. Aldrin, J., Achenbach, J. D., Andrew, G., P'an, C., Grills, B., Mullis, R. T., Spencer, F. W., Golis, M., "Case Study for the Implementation of an Automated Ultrasonic Technique to Detect Fatigue Cracks in Aircraft Weep Holes," *Materials Evaluation*, Vol. 59, n 11, p.1313, (2001).

Awards and Activities

- 2017 American Society of Nondestructive Testing (ASNT) Fellow.
- 2010 TTCP (The Technical Cooperation Program) Team Achievement Award (for Model-Based Methods for Reducing Cost Associated with POD Studies, with Canada and Australia).
- 2009 NASA Engineering and Safety Center (NESC) Engineering Excellence Award.
- 2006 Young NDT Professional Award (ASNT).
- 2002 Outstanding Paper Award, *Materials Evaluation* (ASNT).
- Associate Technical Editor: Materials Evaluation (2013-date)
- Associate Technical Editor: Journal of Nondestructive Evaluation (2022-date)
- President - Mechanics Club - Northwestern University (1999-2000 academic year).
- Volunteer Docent - Oriental Institute Museum - University of Chicago (2003 to date)

Affiliations

- Member - The American Society of Nondestructive Testing (ASNT)
  - Member – ASNT Reliability Commmittee (2002 to date)
  - Member – ASNT Research Council (2005 to date)
  - Member – ASNT NDT 4.0 Commmittee (2019 to date)
- Member - The American Society of Mechanical Engineers (ASME)
- Member - The Acoustical Society of America (ASA)
- Member - The Institute of Electrical and Electronics Engineers (IEEE)

March 23, 2022

Dear US EPA Grant Committee,

We, the undersigned, support the application of Lake County Environmental Works for funding from US EPA "Enhanced Air Quality Monitoring for Communities" RFA#: EPA-OAR-OAQPS-22-01.

We approve of Lake County Environmental Works commitment to address ethylene oxide pollution and environmental justice concerns in Lake County, IL. For the last several years, their members have worked tirelessly to advocate for the reduction of ethylene oxide pollution in the communities of Waukegan and Gurnee, IL, where two facilities known for using and emitting ethylene oxide reside.

Both facilities are in or near environmental justice communities. The last independent round of air testing for our EJ communities was completed in April 2020 and proved inconclusive. There are no plans by the state of Illinois nor Lake County, IL, to conduct further testing. Residents, regardless of race, income, and age, deserve real answers regarding the quality of air to which they are exposed to daily.

We recommend LCEW without reservation and hope they will be one of the recipients. We extend our warmest wishes to all EJ communities who will receive your grant opportunities.

Sincerely,

DocuSigned by:
FD7D602F3CC444C...

3/23/2022

Sam Yingling, IL State Representative, 62nd District — Date

DocuSigned by:
5857F5B4A1FD47D...

3/23/2022

Joyce Mason, IL State Representative, 61st District — Date

DocuSigned by:
42972A8BA7224FF...

3/22/2022

Rita Mayfield, IL State Representative, 60th District — Date

BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 02/28/2022

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. EPA-OAR-OAQPS-22-01		$	$	$ 270,349.64	$	$ 270,349.64
2.						
3.						
4.						
5. Totals		$	$	$ 270,349.64	$	$ 270,349.64

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SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1) EPA-OAR-OAQPS-22-01	(2)	(3)	(4)	Total (5)
a. Personnel	$ 15,600.00	$	$	$	$ 15,600.00
b. Fringe Benefits	0.00				0.00
c. Travel	1,942.00				1,942.00
d. Equipment	170,687.64				170,687.64
e. Supplies	0.00				0.00
f. Contractual	76,000.00				76,000.00
g. Construction	0.00				0.00
h. Other	3,000.00				3,000.00
i. Total Direct Charges (sum of 6a-6h)	267,229.64				$ 267,229.64
j. Indirect Charges	3,120.00				$ 3,120.00
k. TOTALS (sum of 6i and 6j)	$ 270,349.64	$	$	$	$ 270,349.64
7. Program Income	$	$	$	$	$

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SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8. EPA-OAR-OAQPS-22-01	$	$	$	$
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	$	$	$	$

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$	$	$	$	$
14. Non-Federal	$				
15. TOTAL (sum of lines 13 and 14)	$	$	$	$	$

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS) (b)First	(c) Second	(d) Third	(e) Fourth
16. EPA-OAR-OAQPS-22-01	$	$	$	$
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$	$	$	$

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges:

22. Indirect Charges:

23. Remarks:

OMB Number: 4040-0004
Expiration Date: 12/31/2022

Application for Federal Assistance SF-424

* 1. Type of Submission:
- [ ] Preapplication
- [x] Application
- [ ] Changed/Corrected Application

* 2. Type of Application:
- [x] New
- [ ] Continuation
- [ ] Revision

* If Revision, select appropriate letter(s):

* Other (Specify):

* 3. Date Received: 03/24/2022

4. Applicant Identifier: S6HAU593KB79

5a. Federal Entity Identifier:

5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:

7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: Lake County Environmental Works

* b. Employer/Taxpayer Identification Number (EIN/TIN): 88-0750336

* c. UEI: S6HAU593KB79

d. Address:

* Street1: 2566 HERON DR

Street2:

* City: LINDENHURST

County/Parish:

* State: IL: Illinois

Province:

* Country: USA: UNITED STATES

* Zip / Postal Code: 60046-8521

e. Organizational Unit:

Department Name:

Division Name:

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:

* First Name: Teuta

Middle Name:

* Last Name: Tanaka

Suffix:

Title: Director

Organizational Affiliation:

* Telephone Number: 773-663-8569

Fax Number:

* Email: tboci3@gmail.com

Application for Federal Assistance SF-424

*** 9. Type of Applicant 1: Select Applicant Type:**

M: Nonprofit with 501C3 IRS Status (Other than Institution of Higher Education)

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

EPA

11. Catalog of Federal Domestic Assistance Number:

66.034

CFDA Title:

Surveys, Studies, Research, Investigations, Demonstrations, and Special Purpose Activities Relating to the Clean Air Act

*** 12. Funding Opportunity Number:**

EPA-OAR-OAQPS-22-01

* Title:

Enhanced Air Quality Monitoring for Communities

13. Competition Identification Number:

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Add Attachment | Delete Attachment | View Attachment

*** 15. Descriptive Title of Applicant's Project:**

The project will perform air quality monitoring to survey the state of ethylene oxide emissions present in Lake County, Illinois.

Attach supporting documents as specified in agency instructions.

Add Attachments | Delete Attachments | View Attachments

Application for Federal Assistance SF-424

16. Congressional Districts Of:

* a. Applicant: IL10th
* b. Program/Project:

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 01/01/2023
* b. End Date: 02/01/2024

18. Estimated Funding ($):

* a. Federal	270,349.64
* b. Applicant	
* c. State	
* d. Local	
* e. Other	
* f. Program Income	
* g. TOTAL	270,349.64

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

☐ a. This application was made available to the State under the Executive Order 12372 Process for review on .

☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.

☐ c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

☐ Yes ☒ No

If "Yes", provide explanation and attach

Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: Ms. * First Name: Teuta

Middle Name:

* Last Name: Tanaka

Suffix:

* Title: Director

* Telephone Number: 773-663-8569 Fax Number:

* Email: tboci3@gmail.com

* Signature of Authorized Representative:  * Date Signed: 3/25/22

EPA KEY CONTACTS FORM

OMB Number: 2030-0020
Expiration Date: 06/30/2024

Authorized Representative: *Original awards and amendments will be sent to this individual for review and acceptance, unless otherwise indicated.*

Name: Prefix: Ms. First Name: Teuta Middle Name:
Last Name: Tanaka Suffix:
Title: Director
Complete Address:
Street1: 2566 Heron Dr.
Street2:
City: Lindenhurst State: IL: Illinois
Zip / Postal Code: 60046-8521 Country: USA: UNITED STATES
Phone Number: 773-663-8569 **Fax Number:**
E-mail Address: tboci3@gmail.com

Payee: *Individual authorized to accept payments.*

Name: Prefix: Ms. First Name: Teuta Middle Name:
Last Name: Tanaka Suffix:
Title: Director
Complete Address:
Street1: 2566 Heron Dr.
Street2:
City: Lindenhurst State: IL: Illinois
Zip / Postal Code: 60046-8521 Country: USA: UNITED STATES
Phone Number: 773-663-8569 **Fax Number:**
E-mail Address: tboci3@gmail.com

Administrative Contact: *Individual from Sponsored Programs Office to contact concerning administrative matters (i.e., indirect cost rate computation, rebudgeting requests etc).*

Name: Prefix: Dr. First Name: John Middle Name: C
Last Name: Aldrin Suffix:
Title: Director
Complete Address:
Street1: 4275 Chatham Ave.
Street2:
City: Gurnee State: IL: Illinois
Zip / Postal Code: 60031 Country: USA: UNITED STATES
Phone Number: 847-421-7903 **Fax Number:**
E-mail Address: j_aldrin@yahoo.com

EPA KEY CONTACTS FORM

Project Manager: *Individual responsible for the technical completion of the proposed work.*

Name: Prefix: Dr. First Name: John Middle Name: C

Last Name: Aldrin Suffix:

Title: Director

Complete Address:

Street1: 4275 Chatham Ave.

Street2:

City: Gurnee State: IL: Illinois

Zip / Postal Code: 60031 Country: USA: UNITED STATES

Phone Number: 847-421-7903 **Fax Number:**

E-mail Address: j_aldrin@yahoo.com

OMB Number: 2030-0020
Expiration Date: 06/30/2024

Preaward Compliance Review Report for All Applicants and Recipients Requesting EPA Financial Assistance

Note: Read Instructions before completing form.

I. A. Applicant/Recipient (Name, Address, City, State, Zip Code)

Name: Lake County Environmental Works

Address: 2566 Heron Dr.

City: Lindenhurst

State: IL: Illinois Zip Code: 60046-8521

B. Unique Entity Identifier (UEI): S6HAU593KB79

Name: Teuta Tanaka

Phone: 773-663-8569

Email: tboci3@gmail.com

Title: Director

II. Is the applicant currently receiving EPA Assistance? ☐ Yes ☒ No

III. List all pending civil rights lawsuits and administrative complaints filed under federal law against the applicant/recipient that allege discrimination based on race, color, national origin, sex, age, or disability. (Do not include employment complaints not covered by 40 C.F.R. Parts 5 and 7.)

IV. List all civil rights lawsuits and administrative complaints decided against the applicant/recipient within the last year that alleged discrimination based on race, color, national origin, sex, age, or disability and enclose a copy of all decisions. Please describe all corrective actions taken. (Do not include employment complaints not covered by 40 C.F.R. Parts 5 and 7.)

V. List all civil rights compliance reviews of the applicant/recipient conducted under federal nondiscrimination laws by any federal agency within the last two years and enclose a copy of the review and any decisions, orders, or agreements based on the review. Please describe any corrective action taken. (40 C.F.R. § 7.80(c)(3))

VI. Is the applicant requesting EPA assistance for new construction? If no, proceed to VII; if yes, answer (a) and/or (b) below.

☐ Yes ☒ No

a. If the grant is for new construction, will all new facilities or alterations to existing facilities be designed and constructed to be readily accessible to and usable by persons with disabilities? If yes, proceed to VII; if no, proceed to VI(b).

☐ Yes ☐ No

b. If the grant is for new construction and the new facilities or alterations to existing facilities will not be readily accessible to and usable by persons with disabilities, explain how a regulatory exception (40 C.F.R. 7.70) applies.

VII. **Does the applicant/recipient provide initial and continuing notice that it does not discriminate on the basis of race, color, national origin, sex, age, or disability in its program or activities? (40 C.F.R 5.140 and 7.95)** ☒ Yes ☐ No

a. **Do the methods of notice accommodate those with impaired vision or hearing?** ☐ Yes ☒ No

b. **Is the notice posted in a prominent place in the applicant's/recipient's website, in the offices or facilities or, for education programs and activities, in appropriate periodicals and other written communications?** ☐ Yes ☒ No

c. **Does the notice identify a designated civil rights coordinator?** ☐ Yes ☒ No

VIII. **Does the applicant/recipient maintain demographic data on the race, color, national origin, sex, age, or disability status of the population it serves? (40 C.F.R. 7.85(a))** ☒ Yes ☐ No

IX. **Does the applicant/recipient have a policy/procedure for providing meaningful access to services for persons with limited English proficiency? (Title VI, 40 C.F.R. Part 7, *Lau v Nichols* 414 U.S. (1974))** ☐ Yes ☒ No

X. **If the applicant is an education program or activity, or has 15 or more employees, has it designated an employee to coordinate its compliance with 40 C.F.R. Parts 5 and 7? Provide the name, title, position, mailing address, e-mail address, fax number, and telephone number of the designated coordinator.**

XI. **If the applicant is an education program or activity, or has 15 or more employees, has it adopted grievance procedures that assure the prompt and fair resolution of complaints that allege a violation of 40 C.F.R. Parts 5 and 7? Provide a legal citation or applicant's/ recipient's website address for, or a copy of, the procedures.**

For the Applicant/Recipient

I certify that the statements I have made on this form and all attachments thereto are true, accurate and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine or imprisonment or both under applicable law. I assure that I will fully comply with all applicable civil rights statutes and EPA regulations.

A. Signature of Authorized Official	B. Title of Authorized Official	C. Date
Teuta Tanaka	Director	03/23/2022

For the U.S. Environmental Protection Agency

I have reviewed the information provided by the applicant/recipient and hereby certify that the applicant/recipient has submitted all preaward compliance information required by 40 C.F.R. Parts 5 and 7; that based on the information submitted, this application satisfies the preaward provisions of 40 C.F.R. Parts 5 and 7; and that the applicant has given assurance that it will fully comply with all applicable civil rights statures and EPA regulations.

A. Signature of Authorized EPA Official	B. Title of Authorized Official	C. Date

Instructions for EPA FORM 4700-4 (Rev. 04/2021)

General. Recipients of Federal financial assistance from the U.S. Environmental Protection Agency must comply with the following statutes and regulations.
Title VI of the Civil Rights Acts of 1964 provides that no person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. The Act goes on to explain that the statute shall not be construed to authorize action with respect to any employment practice of any employer, employment agency, or labor organization (except where the primary objective of the Federal financial assistance is to provide employment). Section 13 of the 1972 Amendments to the Federal Water Pollution Control Act provides that no person in the United States shall on the ground of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under the Federal Water Pollution Control Act, as amended. Employment discrimination on the basis of sex is prohibited in all such programs or activities. Section 504 of the Rehabilitation Act of 1973 provides that no otherwise qualified individual with a disability in the United States shall solely by reason of disability be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. Employment discrimination on the basis of disability is prohibited in all such programs or activities. The Age Discrimination Act of 1975 provides that no person on the basis of age shall be excluded from participation under any program or activity receiving Federal financial assistance. Employment discrimination is not covered. Age discrimination in employment is prohibited by the Age Discrimination in Employment Act administered by the Equal Employment Opportunity Commission. Title IX of the Education Amendments of 1972 provides that no person in the United States on the basis of sex shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance. Employment discrimination on the basis of sex is prohibited in all such education programs or activities. Note: an education program or activity is not limited to only those conducted by a formal institution. 40 C.F.R. Part 5 implements Title IX of the Education Amendments of 1972. 40 C.F.R. Part 7 implements Title VI of the Civil Rights Act of 1964, Section 13 of the 1972 Amendments to the Federal Water Pollution Control Act, and Section 504 of The Rehabilitation Act of 1973.

Items "Applicant" means any entity that files an application or unsolicited proposal or otherwise requests EPA assistance. 40 C.F.R. §§ 5.105, 7.25. "Recipient" means any State or its political subdivision, any instrumentality of a State or its political subdivision, any public or private agency, institution, organizations, or other entity, or any person to which Federal financial assistance is extended directly or through another recipient, including any successor, assignee, or transferee of a recipient, but excluding the ultimate beneficiary of the assistance. 40 C.F.R. §§ 5.105, 7.25. "Civil rights lawsuits and administrative complaints" means any lawsuit or administrative complaint alleging discrimination on the basis of race, color, national origin, sex, age, or disability pending or decided against the applicant and/or entity which actually benefits from the grant, but excluding employment complaints not covered by 40 C.F.R. Parts 5 and 7. For example, if a city is the named applicant but the grant will actually benefit the Department of Sewage, civil rights lawsuits involving both the city and the Department of Sewage should be listed. "Civil rights compliance review" means: any federal agency-initiated investigation of a particular aspect of the applicant's and/or recipient's programs or activities to determine compliance with the federal non-discrimination laws. Submit this form with the original and required copies of applications, requests for extensions, requests for increase of funds, etc. Updates of information are all that are required after the initial application submission. If any item is not relevant to the project for which assistance is requested, write "NA" for "Not Applicable." In the event applicant is uncertain about how to answer any questions, EPA program officials should be contacted for clarification.

Project Title: Survey of Ethylene Oxide in Lake County, Illinois Using Best Testing Practices
Submitted to: USEPA, Enhanced Air Quality Monitoring for Communities
RFA#: EPA-OAR-OAQPS-22-01
Date Submitted: March 25, 2022
Applicant Information: Lake County Environmental Works (LCEW)
2566 Heron Dr., Lindenhurst, IL 60046-8521
Web site: www.lcew.org
DUNS number 118607136; UEI (SAM) S6HAU593KB79

Technical / Contractual POC: John C. Aldrin, Ph.D, (847) 421-7903, j_aldrin@yahoo.com

Set-Aside: "Community-based organization set-aside". Lake County Environmental Works (LCEW) is a 501(c)(3) organization working to address the outstanding concerns about ethylene oxide (EtO) and Environmental Justice for residents in Lake County IL.

Brief Description of Applicant Organization: Two major EtO emitting facilities are located in Lake County: Vantage Oleochemicals in Gurnee and Medline Industries Inc. in Waukegan. LCEW members have worked over the last three years to address outstanding cancer risks associated with elevated EtO levels. Previous air quality testing has not validated that emission controls are adequately protecting the community, downwind EtO emissions appear to be higher than expected levels based on permit models, and possible warehouse EtO emissions have yet to be monitored or controlled. The goal of LCEW is to lead air testing for EtO to address these issues for the community and demonstrate a methodology for other communities.

Project Location: The benefits of this study are expected to impact a number of communities in Lake County, IL. Communities primarily impacted by the two largest users of ethylene oxide (EtO) in the State are in Gurnee, IL 600031 and Waukegan, IL 60085, with close proximity to Park City, IL 60085, and North Chicago, IL, 60064, with a total population of 158,356 (2020 Census). There is also concern about widespread EtO emissions in Lake County IL (population 714,342) from warehouses with recently sterilized medical devices using EtO, located at several sites throughout the county.

Air Pollutant Scope: The project addresses ethylene oxide (EtO) emissions and air monitoring for this pollutant near several emission hot spots in Lake County, IL. EtO is a class 1 carcinogen [1].

Budget Summary:

EPA Funding Requested	Total Project Cost
$270,349.64	**$270,349.64**

Expected Project Period: Jan. 1, 2023, to Feb. 1, 2024 (1-year study, 1-month final reporting.)

Short Project Description: Past EtO air quality testing was found to be of mixed quality with high uncertainty and has yet to independently validate whether emission controls are adequately protecting the community. A primary objective is to implement recent findings and improved practices [2], and retest around the high-use EtO facilities in Lake County. Downwind emissions appear to be higher than expected levels based on permit models; analysis of results will focus on if such discrepancies are due to higher-than-expected emission levels, errors in the permit model, and/or testing error and uncertainty. As well, possible EtO warehouse emissions, which have yet to be studied adequately in Lake County, will be tested under this project. Lastly, a community-based mobile real-time fence-line monitoring system will be developed and studied to complement planned TO-15/TO-15A canister testing.

II Workplan

Section 1. Project Summary – Background and Project Significance: 60% of cancer risk in US communities is due to the presence of ethylene oxide. Two of the largest EtO users in the Midwest (Region 5) are located within three-aerial-miles of each other in Lake County, IL. While state laws were passed in 2019 to manage EtO use, and the IL EPA created permits to manage emission levels to mitigate cancer risk, a great deal of uncertainty still exists for those living near these facilities. Our community remains deeply concerned that the current permit and ILEPA oversight process will not hold these companies within their respective emission limits, which is necessary for maintaining a cancer risk at less than 100 in a million to the public. This study will provide definitive answers to concerned citizens. Details concerning the outstanding issues are as follows:

a. Address need for improved emissions testing to validate existing controls. Three phases of TO-15/TO-15A canister testing was performed in Lake County around the facilities of Medline and Vantage, from June 2019 to May 2020. Trends are presented Table 1 from the Lake County Phase II and Phase III testing, organized by testing period, proximity to Medline and Vantage and wind direction [3]. It is important to separate and study downwind emission from these facilities, as was organized in this table based on available wind direction data. With a limited number of canisters and varying wind direction, assessing what canisters are upwind versus downwind is a critical step to understand the level of emission coming from these facilities.

Table 1. Trends in processing Lake County Phase II and Phase III Testing data [3], evaluated by testing period, canister site / proximity to Medline and Vantage and wind direction (upwind versus downwind) relative to nearest facility

				Medline M1-M5	Medline M1-M5	Medline M1-M5	Vantage V1-V5	Vantage V1-V5	Vantage V1-V5	Reference R1-R2	Reference R1-R2			
P#	testing period	(# 24hr testing periods) test number	metric	Canisters Upwind of Facility Wind Loc. 1	Canisters Partly Downwind of Facility Wind Loc. 2	Canisters Directly Downwind of Facility Wind Loc. 3	Canisters Upwind of Facility Wind Loc. 1	Canisters Partly Downwind of Facility Wind Loc. 2	Canisters Directly Downwind of Facility Wind Loc. 3	Canisters Upwind of Facility Wind Loc. 1	Canisters Downwind of Facility Wind Loc. 3	# valid canister samples	# invalid canister samples	% invalid samples
2A	Oct 26 2019 - Dec 11 2019	16	mean*	0.129	0.517	0.525	0.136	0.839	1.539	0.142	0.320			
2A	Oct 26 2019 - Dec 11 2019	16	median*	**0.110**	0.330	**0.575**	**0.130**	0.230	**0.920**	**0.140**	0.320			
2A	Oct 26 2019 - Dec 11 2019	16	samples	59	11	8	52	15	10	31	1	187	5	2.6%
2B	†Dec 14 2019 - Jan 22 2020	13	mean*	0.159	0.149	0.182	0.132	0.154	0.212	0.160	0			
2B	†Dec 14 2019 - Jan 22 2020	13	median*	**0.145**	0.140	**0.190**	**0.110**	0.105	**0.200**	**0.170**	0			
2B	†Dec 14 2019 - Jan 22 2020	13	samples	32	21	11	34	16	13	26	0	153	3	1.9%
3A	Apr 4 2020 - Apr 16 2020	5	mean*	0.182	0.336	0.293	0.162	0.342	0.392	0.195	0			
3A	Apr 4 2020 - Apr 16 2020	5	median*	**0.120**	0.260	**0.280**	**0.110**	0.360	**0.440**	**0.225**	0			
3A	Apr 4 2020 - Apr 16 2020	5	samples	5	8	8	9	6	9	10	0	55	5	8.3%
3B	†† Apr 19 2020 - May 2 2020	5	mean*	0.298	0.326	0.330	0.355	0.270	0.455	0.429	0			
3B	†† Apr 19 2020 - May 2 2020	5	median*	**0.185**	0.440	**0.190**	**0.250**	0.290	**0.490**	**0.305**	0			
3B	†† Apr 19 2020 - May 2 2020	5	samples	8	7	5	13	3	4	8	0	48	12	**20.0%**

* mean and median values reported in units of µg/m3

† Medline shutdown (to meet new permit requirements). News also broke of Vantage high readings during November 2019 testing.

†† Two very high readings were initially observed near Vantage, but values were later invalidated. Other testing outliers appear present.

- Phase II upwind readings near Vantage and Medline are similar to far field references (R1 & R2) and Willowbrook after Sterigenics shutdown [mean = 0.138 mg/m3, median 0.122 mg/m3]. This was generally expected. Phase II downwind readings near Vantage and Medline are much higher than background, indicating emissions from both facilities (and well above permit models). After the shutdown of Medline and news reports of high emissions (December 12-13, 2019), Phase II downwind readings near Vantage and Medline were found to approach background levels. This indicates a change occurred with both facilities. It was reported that

Medline shutdown to meet ILEPA permit requirements; however, it is still unclear what change happened at Vantage to produce the lower emissions level at downwind canisters.

- Phase III testing had a much higher rate of invalid canisters relative to phase II This is especially true for the last five periods of testing (after April 19, 2020), where 20% of the canisters were invalidated for pressure anomalies. Upwind and background readings after Apr 19, 2020 were also much higher than historical background concentrations. This was surprising but may be related to higher rate of testing quality issues. Mean values much greater than median values indicates the presence of high number of testing outliers in upwind and background locations, skewing results. Concerning median, emissions were observed to be above background levels downwind of Vantage.

Note, the length of the Lake County Phase III 'validation' canister testing was also limited to only ten 24-hr test periods. While there were original plans to test Medline and Vantage EtO control systems for a longer period of time, permits and EtO control systems / approval were not in place during the longer Phase II testing period. Since this work, the US EPA, ATSDR and testing companies have also learned how to improve the quality and data analysis for TO-15/TO-15A canister testing [2]. This project is expected to finally provide the desired verification testing.

b. Address possible EtO medical device warehouse emissions. There is legitimate concern regarding the storage of recently sterilized medical devices with EtO. Repeated requests have been made to the IL EPA to assess emission levels from warehouses housing recent EtO sterilized medical devices in Lake County. By our understanding, no action has been taken at the state or federal level to address Lake County warehouses. Our community needs supporting data to accept that facilities in IL do not have this issue. Two separate facilities with recently sterilized product in Georgia, Cardinal Health and Becton Dickinson, have been found to exceed EtO emissions of > 4000 lb/year [4] and 5600 lbs/year [5] respectively, using independent third party testing. These levels were so high that the companies are required to obtain permits, under existing standards in Georgia. Even if EtO is being extracted 10 times better here in Illinois, facilities may be emitting 400 to 600 lbs/year, which is well over what is allowed from Vantage and Medline's facilities in Illinois. With limited funds, concerned Lake County community activists strategically tracked the wind direction and placed canisters downwind of a Medline warehouse over two 24-hr periods and followed LC Phase I-III test protocols. Canister results indicated higher than background readings downwind of this facility [6]. To confirm these results, more thorough testing plans are needed in Lake County. This issue is not localized to Lake County residents only, rather it has national implications for other EJ communities living near EtO emitting facilities across the country. This study is expected to address this data gap.

c. Help understand discrepancies with permit models underestimating EtO emissions. There exist clear discrepancies between the permit model residential EtO levels for expected emissions and canister data acquired in residential areas, both in Lake County and at other sites across the US [7][8]. Based on analysis of available data and evidence, the permit model appears to underestimate the community levels of EtO around many of these facilities, thus underestimating cancer risk. AERMOD is primarily used to predict the high-end, ground-level concentrations that are generally used to assess compliance with air quality regulations. AERMOD is a good model at higher test concentrations and incorporates corrections for local buildings / topology. However, AERMOD has documented issues in peer reviewed publications with some conditions (ex: calm

days) and at lower emissions levels, found in the far-field from sources [9]. At distances farther from the facility and considering average emissions over longer periods of time, AERMOD has been found to underpredict ground level concentrations [5]. The issue is that this underestimates risk for residents around these facilities. Contacts with modeling experts at US EPA Region 5 and Research Triangle Park have been made by LCEW. New data from this project will be critical to resolving questions concerning model accuracy at residential locations.

d. Real-time fence-line monitoring demonstrator. Under this grant, there is an opportunity to explore community-based fence-line monitoring solutions to mitigate the risk of high use EtO facilities. Fence-line monitoring has been implemented by the US EPA for benzene monitoring at refineries, which is primarily emitted from fugitive ground-level sources [10]. One important goal of this project is to build and demonstrate a mobile test lab for ethylene oxide as a community-based fence-line solution, which would greatly mitigate cancer risk of living in Lake County IL.

Section 1. Project Summary and Approach – Overall Project Details: The project will consist of the following three primary tasks to achieve the above objectives (a)-(d):

Task 1: Build Mobile Air Monitoring Laboratory for EtO. Past EtO air quality testing was found to be of mixed quality with high uncertainty, primarily due to the limited data available acquired using TO-15/TO-15A canisters. One solution to address issues with uncertainty is to make more frequent measurements over a wider range of locations in the community. A mobile air monitoring laboratory (MAML) offers a flexible and cost-effective way to monitor air quality in communities that do not have fixed air monitoring stations. Mobile monitoring has been shown to be a useful approach for measuring variation of air pollution in urban environments. For example, prior work by Prof. Peltier's group demonstrated a mobile monitoring approach to study the spatial-temporal variability of air and noise pollution in urban neighborhoods [11].

To achieve mobile air quality monitoring, real-time sensing technology of EtO at ambient levels is needed. Picarro has been working closely with industry and communities to develop monitoring systems, based on Cavity Ring-Down Spectroscopy (CRDS), for ethylene oxide that meet current and future regulatory requirements. For example, Picarro offers an ethylene oxide analyzer, G2920, which has a lower limit of detection and is specifically designed for ambient and community monitoring [12]. This system provides fully automated, continuous operation with minimal maintenance requirements. It supports mobile applications through several power supply options (i.e. UPS). This system also provides detection of ppt, ppb and ppm fugitive emissions and support for mobile surveys, with proven expertise of over 15 years supporting global monitoring networks. Picarro systems have been integrated into mobile platforms for monitoring gaseous pollutants [13]. Lastly, community monitoring grants from the EPA have already been used to buy G2920 analyzer for EtO monitoring (by the Georgia EPD).

Lake County Environmental Works will lead the build and verification testing of a mobile air monitoring laboratory for Lake County IL. The platform will include a Picarro G2920 unit and a mobile weather station. Experience from Picarro and Prof. Peltier of University of Massachusetts Amherst will be incorporated in the design and implementation mobile laboratory, including the

power system and mobile transmission of data. Guidance on chemical testing and technical support will be provided by Prof. Ahmad Ali Audi at the College of Lake County.

Task 2: Conduct Test Plan. The test plan has multiple stages. First, building on the Phase I – III Lake County test plan, Task 2(a) will consist of a longer Phase IV plan TO-15/TO-15A canister is proposed [3]. Improved canister testing protocols for facility evaluation will be implemented based on best practices discovered through a recent EPA [2] and ATSDR review of EtO data acquired around the US. Highlights of the Phase IV test plan are as follows:

- Phase IV testing will repeat sampling at the same 12 canister sites, 5 near Medline, 5 near Vantage and 2 "Reference" locations in Gurnee. 20 total testing days, spaced over 60 days (testing every third day) using 24 hour TO-15/TO-15A canisters is proposed [3]. The Quality Assurance plan will be the same as before [3].
- Each morning, NOAA weather forecasts for expected wind direction will be consulted to determine the best position (of 12 clock position) for detecting downwind emissions. Two additional canisters will be positioned around the Medline and Vantage facilities, at fence-line locations, in the downwind direction. Prior data has shown that upwind canisters near these facilities do not detect downwind emissions, while downwind canisters do [3]. This strategy will mitigate the past issue of having no canisters downwind of these facilities.
- Once built and tested, the Mobile Air Monitoring Laboratory (MAML) will be used around these sites during TO-15/TO-15A canister testing. MAML will be able to provide data on 'off days' from canister testing and also provide local wind data. (This will be compared with the NOAA data acquired at the Chicago/Waukegan Regional Airport.)

Second, Task 2(b) will consist of a test plan to address fence-line monitoring of possible EtO warehouse emissions in Lake County IL. The community-based mobile real-time fence-line monitoring system will be used to assess possible emissions around all warehouses of concern with recently sterilized medical devices, throughout Lake County. This testing phase is expected to take approximately 3 months, following the Task 2(a). Again, NOAA weather forecasts for expected wind direction will be consulted to determine the best position (of 12 clock position) for detecting downwind emissions. A limited set of TO-15/TO-15A canister tests will be made in parallel with the MAML system to supplement testing data and help quantify downwind emissions versus background EtO levels in Lake County.

Task 3: Perform Data Analysis. The final step is data analysis of the two test plans addressing (a) verification of existing controls at Medline and Vantage and (b) study of possible EtO medical device warehouse emissions. First, data acquired will be reviewed, following the Quality Assurance Plan, to ensure data quality and identify possible poor data points, as observed in Phase III Lake County canister testing. Data analysis will also address weather data and distinguish upwind versus downwind emissions, which will be critical for. The LCEW team has considerable experience with data analysis. Results will be compared with AERMOD permit model results. Consulting assistance on data analysis will be provided by Prof. Peltier of University of Massachusetts Amherst.

Section 2A. Community Involvement - Partnerships: The goal of the organization is to lead on testing to address EJ concerns for the community and demonstrate a methodology for other communities in the country. LCEW will share all air monitoring results, data analysis, and

interpretations from this project with the public and all relevant state and federal agencies. Data will be shared with contacts at Lake County Health Department, the IL EPA, the US EPA Region 5 office, ATSDR, EPA air quality modelers, our Lake County communities, and IL executive and legislative government branches for decision making on follow-up steps. Collaboration is expected with College of Lake County.

Section 2B/C. Community Involvement – Engagement and Community-Based Organization Set-Aside: Lake County Environmental Works is a 501(c)(3) organization composed of community members in Lake County. Our members have been actively advocating for EJ communities, on the issue of ethylene oxide since 2018. The members of LCEW have demonstrated effectiveness as a representative of the community in several respects. Team members have advocated to our federal, state and local representatives since 2018 for action on this health issue. They have led and participated in various information meetings at the Warren Newport public library to share updates on this issue with the community. They have contacted experts in federal (US EPA, CDC/ATSDR), state (IL EPA) and local (LCHD) organizations and provided their expertise and perspective on outstanding issues. They have also been interviewed by journalists with an interest in telling the story of the environmental challenges of overburdened communities [14].

Section 3 – Environmental Justice and Underserved Communities. A goal of this project is to address the fundamental tenants of Environmental Justice (EJ), to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, for those living near facilities emitting ethylene oxide. According to the USEPA, fair treatment "means no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies." Our group believes that cancer risks must be reduced across Illinois, and that no particular group should suffer a disproportionate burden; we view the current situation as antithetical to the concept of environment justice.

Medline Industries is a commercial sterilizer located at 1160 Northpoint Boulevard in Waukegan, IL. Medline uses ethylene oxide to sterilize medical equipment and devices. Vantage Specialties, Inc. (Vantage), 3938 Porett Dr. in Gurnee, manufactures ingredients used in personal care, food and industrial products. The reactors in the alkoxylation area of the plant use ethylene oxide as a raw material. The ethylene oxide is piped into sealed reactors along with other raw materials. The ethylene oxide reacts with the other raw materials to form the desired chemical products. Medline and Vantage facilities are located within a three-mile aerial distance from each other, encircling several EJ communities in Waukegan, Park City, North Chicago, and Gurnee, IL.

Gurnee and Waukegan, Illinois, where Vantage and Medline's facilities are located, are overburdened communities that deserve environmental justice initiatives by the USEPA. Park City and North Chicago, located immediately south of the Vantage and Medline facilities, are also EJ communities. These towns were designated as such through a calculation utilizing the USEPA tool EJ Screen [16] and a demonstrated higher risk of exposure to pollution based on environmental and socioeconomic factors.

In an Illinois Department of Public Health report "Cancer Incidence near Two Facilities Utilizing Ethylene Oxide, Lake County, Ill., 1998-2017", the demographics were reported for the study group area including census tracks from Gurnee, Waukegan, Park City and North Chicago IL, based on the 2010 census data [15]. For a population of 60,190 living near these facilities, 18.1% were black, 39.6% were Hispanic, yielding a more diverse population than the rest of Lake County and the state of Illinois in general. The population was also much younger, and likely more transient, than the two referents considered in the cancer risk assessment study. [Note, while no definitive conclusions were made in this report, that was reasonably expected in hindsight given the expected cancer risk due to the presence of high levels of EtO, the demographics, and uncertainty in the study.]

Along with EtO, these communities face higher risks of air pollution from a variety of sources. Waukegan contains an Edison International coal plant, which was named as one of the worst environmental justice offenders in a 2012 NAACP report. According to a National Research Council, the coal plant is responsible for $520 million and $690 million in public health damages since 2002. This Waukegan coal plant is the largest source of air and water pollution in Lake County. The retirement of this plant has been the result of extensive community organizing efforts, which is an ongoing fight because the coal ash polluter is refusing to clean up the site. The nearby Waukegan Harbor has seriously contaminated the shore of Lake Michigan with polychlorinated biphenyls (PCBs). A newly opened Foxconn factory in Racine, WI threatens to worsen our region's air and water quality by contaminating the headwaters of the Des Plaines River. Based on EJScreen [16], Figure 1 shows much of this area is above 90 percentile EJ Indexes for 2017 Air Toxics Cancer Risk and has a high Socioeconomic Demographic Index.

Figure 1. EJScreen Maps for Lake County region of concern: (a) 2017 Air Toxics Cancer Risk, (b) Hazardous Waste Proximity, (c) Socioeconomic Indicator - Demographic Index.

Gurnee, Waukegan, North Chicago, and Park City are prime examples of the overburdened communities that USEPA Administrator Regan and Assistant Administrator Starfield are calling to protect. But they are not the towns in Region 5 that received initial attention from USEPA. Willowbrook, Illinois, an affluent and less diverse community where Sterigenics was located, effectively petitioned the EPA for additional monitoring and action. Sterigenics was a commercial sterilizer operating in Willowbrook, IL. The Sterigenics facility in Willowbrook has not operated since a February 15, 2019 seal order was put in place; later the company indicated that it ceased operations permanently at the site. In contrast to Gurnee, Waukegan, Park City, and North

Chicago, Willowbrook is more affluent. Extending that same hand to our Lake County communities would further the USEPA's stated goal of environmental justice for all.

Most troubling is Medline and Vantage's proximity to schools and residential areas, which are populated with children, a clearly susceptible population. Fifteen schools are less than three miles away from the facilities. Spaulding School is under 3,500 feet away from Vantage. In comparison, Willowbrook's Hinsdale South High School, also located less than a mile away from an EtO-emitting facility, suffered greatly from the effects of inhaling ethylene oxide. The majority of those fifteen schools are located between Vantage and Medline. With residents living within 1.5 miles of Sterigenics possessing up to ten times a higher risk of developing cancer than other Willowbrook residents [17], this raises serious concerns for students attending any of the fifteen schools located between Vantage and Medline.

Section 4A – Environmental Results - Expected Project Outputs and Outcomes. This study will resolve past testing issues, by more directly investigating downwind emissions from these facilities and better assessing background levels of ethylene oxide in the community. As well, the data produced from this study will be critical for the verification of the permit models for simulating ground level fugitive emissions and average exposure in the community over time. The creation of a community-based mobile real-time fence-line monitoring system will become a valuable tool for testing over a much wider range of locations. As well, possible EtO warehouse emissions, which have yet to be studied adequately in Lake County, will be tested under this project. Such data from possible warehouse emissions will guide the possible legislation in Illinois on warehouse facilities and permit requirements. All project outputs will inform the community and ensure that the Lake County cancer risk matches the lower levels of risk found in the rest of the state of Illinois.

Section 4B - Environmental Results – Performance Measures and Plan. Data acquired during this project can be directly applied to address several outstanding questions for the community, (a) to validate that emission controls are working at Medline and Vantage facilities and (b) investigate the level of possible EtO warehouse emissions in Lake County from recently sterilized medical devices Olaguer et al. have demonstrated in Michigan how air quality measurements and data analysis techniques can be applied to assess emission levels emanating from facilities that emit ethylene oxide [18]. Best practices learned from statistical model work at ATSDR will be applied to the data and estimate emission levels and resulting increased levels of EtO experienced by residents of Lake County IL. These results will be compared to permit models and determine if there are reasons to investigate further possible high ground levels of EtO. Results will also be shared widely within the community that is continuing to study this issue.

Section 4C – Environmental Results – Timeline and Milestones. The expected start date for the project is January 2023. The one year and one month project timeline, with milestones is as follows:

1. **January 2023, Task 1a:** Finalize design of mobile air measurement lab, procure and install Picarro system, weather station, power source and mobile station trailer.
2. **February 2023: Task 1b:** Test Picarro in mobile lab and procure canisters for Task 2 testing. Finalize sampling plan and quality assurance procedures.

3. **March-April 2023: Task 2a:** Verification of existing controls at Medline and Vantage (i.e. Lake County Phase IV test plan). Acquire EtO samples over 60-day period using both TO-15/TO-15A canister testing and MAML.
4. **May - June 2023:** Send canisters to lab for analysis, Data review (from Task 2a), cleaning, and analysis phase, MAML performance assessment and calibration.
5. **June - August 2023: Task 2b:** Evaluation of possible EtO medical device warehouse emissions using MAML.
6. **Sept. - Oct. 2023**: Data review (from Task 2b) and analysis phase. Hotspot analysis with follow-up targeting sampling as needed.
7. **Nov. – Dec. 2023**: Draft report to EPA, hold community data dissemination event, publish methodology and guidance on real-time fence-line monitoring demonstrator for ethylene oxide.
8. **January 2024:** Final reporting to EPA, publish manuscript, share all results with all parties involved and media.

Section 5 – Quality Assurance Statement

Lake County Environmental Works, a community based group, will rely on existing best practices and Quality Assurance Project Plans (QAPP) that have been previously defined for Lake County TO-15/TO-15A canister testing for ethylene oxide [19]. The same plan will be applied to data acquired from the Picarro system. The technical POC will manage the data review process, with assistance from team members and partners. All data will be freely shared with the Lake County Health Department, as in past Phase I-III testing periods, and with other organizations with interest in community trends concerning ethylene oxide.

Section 6A – Programmatic Capability / Past Performance

Lake County Environmental Works is submitting for their first grant proposal for the "Community-based organization set-aside". LCEW has no past funded assistance agreements to cite here. Dr. John Aldrin, the technical POC for Lake County Environmental Works, has over 20 years of experience in modeling and simulation, data analysis, inverse methods, and reliability assessment for various testing modalities. He has been involved with a number of Federal DoD and NASA contracts over the years (dba Computational Tools). Other LCEW scientific team members have knowledge and experience with best practices for TO-15/TO-15A canister testing. With limited funds, team members have performed TO-15/TO-15A testing in the past, following Lake County Phase I-III test protocols [6].

Section 6B – Programmatic Capability / Reporting Requirements

Lake County Environmental Works recently formed to become a grant-eligible 501(c)3 group; however, the members have worked on this issue since 2018 (as part of other organizations). We are submitting LCEW's first grant proposal here, for the "Community-based organization set-aside", and thus have no past funded assistance agreements to cite. However, our team members have previous experience with federal contracting and reporting requirements..

Section 6C – Programmatic Capability / Staff Expertise

Dr. John C. Aldrin obtained his Ph.D. degree in Theoretical and Applied Mechanics from Northwestern University in 2001, and Master's and Bachelor's degrees in Mechanical Engineering from Purdue University in 1996 and 1994 respectively. Since 2001, he has been working as the principal of Computational Tools, specializing in modeling and simulation, data analysis, inverse methods, and reliability assessment for nondestructive testing (NDT). Contracts have included a Visiting Scientist position with the Air Force Research Laboratory leading research on computational method in NDE, and participation in the NASA Engineering and Safety Center (NESC) Nondestructive Evaluation (NDE) Technical Discipline Team (TDT). Dr. Aldrin has co-authored over 170 journal, conference, and book publications in the field of nondestructive testing. He is an associate technical editor for Materials Evaluation and is a Fellow of American Society of Nondestructive Testing.

Tea Tanaka is a senior scientist with previous experience in TO-15/TO-15A canister testing. Ms. Tanaka has a Master's degree in Molecular Biology from University of Illinois at Chicago and a Bachelor degree in Biochemistry from North Central College. Ms. Tanaka has had an active involvement with our EJ communities, raising awareness of ethylene oxide, and explaining cancer risks to the public.

Section 6C – Programmatic Capability / Partner Expertise

Prof. Peltier – University of Massachusetts: Richard Peltier is an Associate Professor in the Department of Environmental Health Science. His research is in human exposure assessment to atmospheric pollutants. He holds a PhD in Atmospheric Chemistry, and a Master of Public Health in Environmental Health, and has more than 15 years of experience in analysis of ambient datasets, field monitoring, analytical chemistry, and interpretation of results for policy makers. He has been a part of our group for more than three years assisting us with understanding past and current ethylene oxide monitoring campaigned by EPA and ILEPA, and has regularly interacted with local and national media outlets on these issues. Dr. Peltier has included a letter of support in this application which illustrates the technical expertise and deliverables that he will provide to this project.

Prof. Ahmad Ali Audi at the College of Lake County: Dr. Ahmad Audi is an Instructor in Chemistry and the Chair of Nanotechnology program at the College of Lake County since 2007. He earned his PhD in Analytical Chemistry from Kansas State university in 2003. Dr. Audi chaired the Nanotechnology Dept at the college from 2010 to 2016, where he equipped the program with state-of-the-art equipment that are traditionally reserved for graduate students. During his nanotechnology tenure, he presented at local community events. He has been teaching an air quality related chemistry course since 2017, in which students perform related experiments and tour local related facilities. Dr. Audi has been active in supporting environmental testing in Lake County and worked with students on a past project testing EtO levels in Waukegan, IL.

Section 7. Budget:

Line Item & Itemized Cost	EPA Funding**
Volunteer Personnel	
(1) Technical POC (Volunteer)	$0.00**
(2) Project Testing Staff @ $25/hr x 12 hrs/wk x 52 wks	$15,600.00
TOTAL PERSONNEL	**$15,600.00**
Travel	
Mileage for Staff: 50 mi/wk @ $.17/mi x 52 wks	$442.00
Prof. Peltier travel to Chicago (two nights) [Est. $500 flight, $300 car rental, Chicago per diem ($216 + $79)]	$1500.00
TOTAL TRAVEL	**$1,942.00**
Equipment / Service	
Picarro G2920 [Quotation # QU11300]	$160,687.64
Weather station (see Weather Station Quote.pdf + tax)	$1,100.00
Rechargable power source	$1,000.00
Remote wifi access	$500.00
Trailer (see Trailer Quote.pdf + tax)	$7,540.56
TOTAL EQUIPMENT	**$170,687.64**
Contractual	
Rented Canisters + TO-15/TO-15A Lab Testing	$56,000.00
Consulting Services - Prof. Peltier	$15,000.00
Consulting Services – College of Lake County	$5,000.00
TOTAL CONTRACTUAL	**$76,000.00**
Other	
Community Meeting Logistics, Data Dissemination	$3,000.00
TOTAL OTHER	**$3,000.00**
Indirect Charges	
Federal Indirect Cost Rate x Personnel = Indirect Costs (Federal Negotiated Indirect Cost Rate = 20%)*	$3,120.00
TOTAL INDIRECT	**$3,120.00**
TOTAL FUNDING	**$270,349.64**
TOTAL PROJECT COST††	**$270,349.64**

** EPA Funding amount must be included on the SF-424 in Section 18.a and SF-424A in: cell 5(e) under Section A – Budget Summary; and Column (1) under Section B – Budget Categories.

†† Total Project Cost must be included on the SF-424 in Section 18.g and SF-424A in: cell 5(g) under Section A – Budget Summary; and column (5), Row k under Section B – Budget Categories.

* Lake County Environmental Works is a non-profit 501(c)(3) founded in 2/2022, thus indirect rates are based on projections.

** All work on expected project by TPOC will be performed on a volunteer basis.

References:

[1] Evaluation of the Inhalation Carcinogenicity of Ethylene Oxide, (December, 2016), Web site: https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/1025_summary.pdf.

[2] "Ethylene Oxide Measurements Method TO-15/TO-15A Overview, Challenges, Resources and Next Steps," OAQPS/AQAD/AAMG, Ambient Air Monitoring Group, April 15, 2021, https://www.epa.gov/sites/default/files/2021-05/documents/eto-technical-webinar-041521-w-qandas.pdf.

[3] Ethylene Oxide Air Monitoring Results, Lake County IL. https://www.lakecountyil.gov/4188/EtO-Monitoring-Results. Raw data: https://docs.google.com/spreadsheets/d/1mrY1MbFWUT5-ysl7SpD74CKMKOMo4x9i5wZAArdYJ2k/edit#gid=1269948513

[4] https://epd.georgia.gov/document/document/cardinalhealthwarehouse-nov2020-09-04pdf/download.

[5] https://epd.georgia.gov/bd-becton-dickinson-and-company-covington.

[6] https://www.documentcloud.org/documents/20493385-air-monitoring-maps-with-data-and-windrose-aug-sept-2020-1-1 .

[7] Miller, A., Goodman, B., "Georgia Plant Reports 8-Day Ethylene Oxide Leak," October 4, 2019, https://www.webmd.com/cancer/news/20191004/georgia-plant-reports-8-da-ethylene-oxide-leak.

[8] https://epd.georgia.gov/ethylene-oxide-information

[9] Perry, S.G., Cimorelli, A.J., Paine, R.J., Brode, R.W., Weil, J.C., Venkatram, A., Wilson, R.B., Lee, R.F. and Peters, W.D., 2005. "AERMOD: A dispersion model for industrial source applications. Part II: Model performance against 17 field study databases," *Journal of Applied Meteorology*, *44* (5), pp.694-708.

[10] DeWees, J. M., "Refinery Fenceline Monitoring & Method 325A" October 28th, 2015, https://www3.epa.gov/ttn/amtic/files/ambient/airtox/2015workshop/Petroleum%20Refinery.pdf. National Air Toxics Monitoring and Data Analysis Workshop.

[11] Shakya, K.M., Kremer, P., Henderson, K., McMahon, M., Peltier, R.E., Bromberg, S. and Stewart, J., 2019. Mobile monitoring of air and noise pollution in Philadelphia neighborhoods during summer 2017. Environmental Pollution, 255, p.113195.

[12] "G2920 Gas Concentration Analyzer," https://www.picarro.com/products/g2920_gas_concentration_analyzer.

[13] Xia, T., Catalan, J., Hu, C. and Batterman, S., 2021. Development of a mobile platform for monitoring gaseous, particulate, and greenhouse gas (GHG) pollutants. Environmental Monitoring and Assessment, 193(1), pp.1-22.

[14] Lerner, Sharon, "Tracking the invisible killer," The Intercept, March 18, 2021, web site: https://theintercept.com/2021/03/18/epa-pollution-cancer-ethylene-oxide/.

[15] https://dph.illinois.gov/content/dam/soi/en/web/idph/publications/idph/data-and-statistics/epidemiology/cancer-registry/Lake%20County%20IL_EtO_98-17%20FINAL.pdf.

[16] EJSCREEN: Environmental Justice Screening and Mapping Tool, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/ejscreen (last visited 03/16/2022).

[17] Eric Horng, EPA: Residents Within 1.5 Miles of Willowbroook Sterigenics Plant Had Up to 10 Times Higher Risk of Cancer, ABC 7 EYEWITNESS NEWS, (May 29, 2019) https://abc7chicago.com/health/epa-residents-within-15-miles-of-sterigenics-plant-had-up-to-10x-higher-risk-of-cancer/5322586/.

[18] Olaguer, E. P., et al.,"Ethylene Oxide Exposure Attribution and Emissions Quantification Based on Ambient Air Measurements near a Sterilization Facility," Int. J. Environ. Res. Public Health, (2020), 17, 42, http://dx.doi.org/10.3390/ijerph17010042.

[19] US EPA. "Method TO-15: Determination of volatile organic compounds (VOCs) in air collected in specially-prepared canisters and analyzed by gas chromatography/mass spectrometry (GC/MS)." EPA/625/R-96/010b (1999).

Attachments:

Attachment File:	Attachment Description:
QA Statement - LCEW and epa-to-15_0.pdf	Quality Assurance Statement
Proof of Nonprofit Status - LCEW.pdf	Proof of Nonprofit Status
Community Based Organization - Support Letter.pdf	Community-based Organization Documentation
Picarro Quote - G2920 - QU11300.pdf	Quote from Picarro - G2920 and Support
2022_eto_LOS_PELTIER.pdf	Letter of Support from Prof. Peltier
Mobile Lab Quote Misc.pdf	Quotes for Mobile Lab Components
Aldrin_Resume_2022.pdf	Resume of TPOC, Dr. John Aldrin

PICARRO

Quotation # QU11300

Sales Rep	Markovic, Milos
Sales Rep Email	MMarkovic@picarro.com
Sales Rep Phone	1 (647) 928-4012

Date of Issue	02/01/2022
Expires	04/01/2022
Payment Terms	Prepay 100%
Currency	US Dollar
Shipping Terms	FOB Origin
Named Place	Picarro, Inc., Santa Clara, CA 95054
Lead Time	8 - 14 weeks ARO, based on inventory

Prepared For

Stop EtO in Lake County
Tea Tanaka
tea.stopeto@gmail.com
T. 773-663-8569

John Aldrin
(847) 599-1213
aldrin@computationaltools.com

Bill To

Tea Tanaka
Stop EtO in Lake County
Gurnee IL 60031
United States
T. 773-663-8569

Ship To

Tea Tanaka
Stop EtO in Lake County
Gurnee IL 60031
United States
T. 773-663-8569

Additional Information

PLEASE NOTE
Zero Reference Module is a peripheral device for automated zero referencing and improved limit of detection. It is currently (as of Feb 1, 2022) an unreleased product. As such, Picarro cannot guarantee lead time or delivery. Price is provided for grant budgetary request estimate at the time of quotation (February 1, 2022).

Line	Item	Description	Qty	List Price	Net Price	Ext. Net Price
		Main Analyzer				
1	**G2920**	• Picarro Ethylene Oxide (EtO) Analyzer - Simultaneous measurement of C2H4O, CO2, CH4, and H2O concentrations in air. • Cavity Ring-Down Spectroscopy (CRDS) - Leverages Picarro's unique, time-based laser measurement technology for quantifying spectral features in an optical cavity. • Best-in-class EtO precision and LDL – 2 sec. precision of 400 ppt+0.1% of reading and 300 sec. precision of 33 ppt+0.02% of reading. Lower Detection Limit (LDL) of 100 ppt (3 sigma, 300 sec). • Best-in-class EtO stability - Zero drift of 375 ppt (peak-to-peak) over 72 hours with no need for re-zero. • Best-in-class response of EtO - Small cavity (35 mL) for fast sample turnover rate. Wetted parts at 80°C for fast sample response, low EtO adhesion, and high sample dew point operation. • Best-in-class spectral sensitivity and selectivity - Employs novel broadband CRDS with proprietary wavelength monitor (WLM) for superior sensitivity, stability, and selectivity, with ultra-low cross-interference with other gas species. • User-friendly UI - Ships with Microsoft Windows 10 Operating System. All analyzer data files are recorded in real-time, in tab-delimited compatible format (*.dat) for easy export and analysis. Multiple species and measurement parameters are displayed in real-time for instant evaluation.	1	$105,000.00	$105,000.00	$105,000.00

Line	Item	Description	Qty	List Price	Net Price	Ext. Net Price
2	**SH1002**	Freight Prepaid and Added, for shipping in USA We will contract our freight forwarder to deliver to your destination (please specify). The amount specified here represents shipping and insurance charges, all of which will be prepaid by Picarro as a courtesy service and charged back to customer on the invoice.	1	$400.00	$400.00	$400.00
3	**Subtotal**					**$105,400.00**
		Peripherals				
5	**MISC-SALE**	Zero Reference Module. For automated zero referencing and improved limit of detection. Unreleased product. No guarantee of lead time or delivery. Price provided for budgetary estimate at the time of quotation.	1	$30,000.00	$30,000.00	$30,000.00
6	**A0950**	Rack mount configuration for 2000 series analyzers. Includes hardware to facilitate rack mount installations in a standard 19" rack. The mount is not sufficient to support weight of analyzer, therefore additional shelving support is required. For analyzers only. External pump can be housed on floor or shelf next to rack mount.	1	$312.00	$312.00	$312.00
7	**A0901**	Monitor, 19" LCD Display with DVI Port 19" LED LCD Display with 1280 x 1024 resolution, 100,000,000:1 contrast ratio, 5ms response time, DVI (HDCP) and VGA port, and adjustable display angle	1	$396.00	$396.00	$396.00
8	**Subtotal**					**$30,708.00**
		Available Services				
10	**W3102**	Premium Service Plan, per year, per analyzer. In addition to the basic telephone & email support and remote diagnostic & repair, this plan also includes: • Free factory repair • Free yearly maintenance kit • Free Field Replaceable Parts See data sheet for complete terms and conditions.	1	$5,500.00	$5,500.00	$5,500.00
11	**S2084**	On-site installation and training for 1 (one) Picarro analyzer. Includes travel and lodging.	1	$8,223.00	$8,223.00	$8,223.00
12	**Subtotal**					**$13,723.00**

Total Extended List Price	$149,831.00
Tax Total	$10,856.64
Total Package Price	$160,687.64

Footer Notes

Picarro's limited warranty for parts and labor is described in Picarro's Terms and Conditions of Sale below. Unless specifically noted in the Quote, prices do not include electrical certification, currency conversion fees, import fees, customs duties, sales tax, goods and services tax, harmonized sales tax, or freight. Customer's purchase order must be received by the expiration date listed on the Quote. If customer elects to purchase the Picarro products quoted herein through a third-party dealer, distributor, agent or local representative, Picarro will not be responsible for any additional charges payable by customer arising therefrom, including any taxes, fees, duties, or local charges from such third party, and customer may not deduct such taxes, fees, duties or charges from the amounts invoiced by Picarro. Unless otherwise agreed to in writing by Picarro, title and risk of loss or damage shall pass to customer upon delivery of the Picarro products to the shipping carrier at Picarro's manufacturing facility.

Terms and Conditions of Sale - Picarro, Inc.

1. GENERAL

The terms and conditions set forth herein, together with any additional terms and conditions set forth in Seller's Quotation (the "Quote") and/or Order Acknowledgement Form, shall constitute the entire agreement between Picarro, Inc. ("Seller") and the applicable customer ("Buyer") for the sale of Seller's products, including systems and spare parts (collectively the "Products"). Any services provided by Seller are subject to Seller's Service and Support Obligations. Seller will not be bound by any terms of Buyer's order that are inconsistent with the terms hereof. All purchase orders must be approved and accepted in writing by Seller and no term or condition contained in any purchase order form that varies from, or conflicts with, any of these Terms and Conditions shall become part of the contract for the sale of Products unless such term or condition is expressly accepted in writing by Seller's authorized representative. No waiver by Seller of any default or provision hereof shall be deemed a waiver of any other default or provision.

2. PRODUCTS PROVIDED AND PRICE

(a) Prices quoted are only for the Products and services (if any) set forth in the Quote or Order Acknowledgement Form and do not include technical data, patent or other proprietary rights of any kind or tests other than Seller's standard tests unless expressly agreed to in writing by Seller. Unless otherwise stated by Seller in writing, all quotations constitute offers and are firm for, and unless noted, expire, sixty (60) days after the date thereof.

(b) Prices do not include federal, state, provincial or local sales, excise, use or other taxes applicable to the Products or services incident to this transaction (excluding only taxes based on Seller's income). Applicable taxes will be added to the sales price if Seller has the legal obligation to collect the same and will be invoiced to and paid by Buyer, unless Buyer provides Seller with a proper tax exemption certificate. In the event Seller is required to pay any such tax, Buyer shall promptly reimburse Seller therefore.

(c) Unless otherwise provided on the face hereof, Products furnished hereunder shall be newly manufactured, but may contain components that have been previously used in other product units. Any previously used components shall have been disassembled, reprocessed and reassembled, as appropriate, and meet the Seller's specifications for newly manufactured components.

(d) The obligation of Seller to provide Products, as well as any technical assistance, shall be subject to such United States laws and regulations as shall govern the license and delivery of technology and products abroad by persons subject to the jurisdiction of the United States, including the Export Administration Act of 1979, as amended, any successor legislation, and the Export Administration Regulations issued by the Department of Commerce. Buyer will comply fully with the Export Administration Regulations and all other applicable United States laws and regulations governing exports.

3. PAYMENT TERMS AND SECURITY INTEREST

(a) Unless otherwise stated in the Quote and Order Acknowledgement Form, the terms of sale for Products are payment at time of order. Upon reviewing Buyer's credit status, Seller may offer payment terms of net 30 days from date of invoice. Seller reserves the right to require alternative payment terms based upon Buyer's credit application. Buyer warrants that the credit application and other financial statements submitted to Seller are true and correct. All amounts payable shall be invoiced and paid in United States dollars and all payments shall be made to Seller at its office in Santa Clara, California, or to such other location as Seller may designate. Interest accrues on the unpaid balance of overdue invoices at the lesser of one percent (1%) per month, or the highest rate allowed by law, from the original due date of the invoice. Payment shall not be withheld for delay in installation if at Buyer's request, nor for delay in delivery of required documentation unless a separate price is stated therefore, and then only to the extent of the amount stated.

(b) All orders, and the obligation of Seller to make delivery, are subject to the right of the Seller to make shipment C.O.D or to require alternative payment terms, including payment of all or any part of the purchase price in advance of delivery. If Buyer: i) fails to make advance payment when requested by Seller, ii) is or becomes delinquent in the payment of any sum due Seller, or iii) refuses to accept C.O.D. shipment, then Seller shall have the right, in addition to any other remedy to which it may be entitled in law or equity, to cancel any order, refuse to make further deliveries and/or declare immediately due and payable all unpaid amounts for Products previously delivered to Buyer. Partial shipments made under any purchase order shall be treated as a separate transaction and payment therefore shall be made accordingly. However, in the event of any default by Buyer, Seller may decline to make further shipments without in any way affecting its rights with respect to such partial shipment.

4. SHIPMENT AND INSURANCE; TITLE TRANSFER AND RISK OF LOSS

(a) The price of all Products, unless otherwise specifically stated in the Quote or Order Acknowledgement Form, is FOB Origin (for U.S. customers) or Ex- Works, Santa Clara, California (for customers located outside the U.S.), each as defined by Incoterms 2020. The costs of normal packaging, handling and document preparation fees (if applicable) are disclosed on the invoice. Where Buyer specifies special packaging or handling, a charge will be made to cover any extra expense. If requested by Buyer, Seller will arrange for selection of a shipping company and shipment on Buyer's behalf. In the absence of shipping instructions from Buyer, Seller reserves the right to select the means of transportation and routing. Unless otherwise advised, Seller will insure Products to their full value or declare full value thereof to the shipping carrier and all shipping and insurance costs shall be for Buyer' account and Buyer agrees to reimburse Seller for the cost of shipping and insurance. Confiscation or destruction of, or damage to, Products shall not release, reduce or in any way affect Buyer's obligation to pay for same.

(b) Unless otherwise agreed to in writing by Seller, title and risk of loss or damage shall pass to Buyer upon delivery of the Products to the shipping carrier at Seller's manufacturing facility.

5. INSPECTION OF PRODUCTS

Buyer shall have the right to inspect the Products upon delivery. Buyer's exclusive remedy with respect to any defective or non-conforming Product shall be to have Seller repair or replace such defective or nonconforming Product or credit Buyer's account, whichever Seller may elect in its sole discretion. These remedies are available only if: i) Buyer notifies Seller promptly upon Buyer's discovery of a Product defect or non-conformity, in writing and within the warranty period; ii) Seller's examination of such Product discloses to Seller's satisfaction that such defect or non-conformity actually exists and the Product has not been repaired or altered by persons not authorized by Seller, subject to misuse, negligence or accident, or connected, installed, used or adjusted otherwise than in accordance with the instructions furnished by Seller. If it is found that any Product has been returned which is not defective or non-conforming, Buyer will be notified and such Product returned at Buyer's expense. In addition, a charge for testing and examination may, in Seller's sole discretion, be made on any Product so returned.

6. CANCELLATIONS

Any order for a standard Product accepted by Seller but cancelled by Buyer prior to shipment, shall be subject to a cancellation charge of five percent (5%) of the order value to cover the costs of processing and order handling. If cancellation occurs less than ten (10) days before the estimated shipment date, such cancellation shall be subject to written acceptance by Seller and a cancellation charge of ten percent (10%) of the order value.

Buyer understands and agrees that such charges are reasonable in light of the anticipated or actual harm to Seller, the difficulties of proof of loss and the inconvenience to Seller of otherwise being reasonable compensated for its efforts as a result of the cancellation of any purchase order.

7. SOFTWARE LICENSE

For all software Products proprietary to Seller and furnished by Seller to Buyer, Seller grants to Buyer a nonexclusive, perpetual (unless otherwise set forth in a Quote) nontransferable license to use the software Products for their intended purpose. Buyer will not distribute, modify, decompile or reverse engineer the Software nor permit anyone else to do so. Any software Products published by a third party are licensed to Buyer pursuant to such software publisher's terms and conditions.

To the extent that the Products contain or consist of software that is pre-installed or embedded in object code and is necessary for the proper functioning of the Products ("Firmware"), such Firmware is licensed to Buyer, not sold. All Firmware is protected by U.S. copyright law and international treaties. Seller grants to Buyer a non-exclusive, perpetual license to use the Firmware, in executable form, solely as embedded in the Products. Buyer acknowledges that the Firmware contains trade secrets of Seller, and, in order to protect such trade secrets, Buyer agrees not to disassemble, decompile or reverse engineer the Firmware nor permit any third party to do so, except to the extent such restrictions are prohibited by law. Seller reserves all rights and licenses in and to the Firmware not expressly granted to Buyer.

The Firmware or other software licensed by Seller to Buyer may contain software or libraries that are licensed or distributed as "open source software", "free software" or other similar licensing or distribution models ("Open Source Software"). Buyer agrees that Open Source Software is and shall remain subject to the terms and conditions of the original providers and are not part of the Firmware or software Products licensed by Seller.

8. LIMITED WARRANTY, LIMITATION OF REMEDIES

(a) Except as otherwise agreed by Seller and Buyer in writing, Seller warrants that during the Warranty Period (as defined below) the Products will be free from defects in material and workmanship under normal uses, and will conform to Seller's published Specifications for the Product. "Specifications" means the then-current user guide, technical specification or other Product documentation prepared by Seller (excluding marketing collateral). The "Warranty Period" means the period of time commencing upon shipment of the Product and continuing for thirteen (13) months (for shipments directly to Buyer) or fifteen (15) months (for shipments to a Seller partner).

(b) Buyer's sole and exclusive remedy and the entire liability of Seller and its suppliers under this limited warranty will be, at Seller's option, repair of the Product; shipment of a replacement Product within the warranty period and according to Seller's replacement process; or a refund of the purchase price if the Product is returned to Seller. Seller replacement parts used in Product replacement may be new or equivalent to new. Seller will provide all parts and services required to repair or replace the Product, provided that repairs will be performed remotely or at Seller's factory. As part of the limited warranty, during the Warranty Period Seller may provide: (1) telephone and email technical support, including remote log-in capabilities during Seller' regular support hours and (2) software updates that Seller generally makes available without additional cost. Seller reserves the right to use local, authorized partners to assist in providing warranty repairs and/or factory returns and Buyer will cooperate with such local partners.

(c) In the event Seller replaces the Product under this warranty, the terms of Section 8 will apply. For any repair or replacement of a product under warranty, the Warranty Period will be extended for the longer of a) ninety (90) days, or b) the period of time during which Buyer has been unable to use the Product based upon the date on which the Buyer or partner first reported to Seller the problem giving rise to the warranty claim. The warranty periods for spare parts, consumables and repairs outside of warranty are not included in this document and are described under the Service and Support Obligations.

(d) The foregoing warranty: i) is made to Buyer only, and is nontransferable; ii) IS IN LIEU OF, AND BUYER HEREBY WAIVES ANY AND ALL OTHER WARRANTIES OF SELLER, EXPRESS, STATUTORY, WRITTEN, ORAL, OR IMPLIED, ARISING OUT OF THIS AGREEMENT OR IN CONNECTION WITH THE ANY AGREEMENT BETWEEN BUYER AND SELLER TO WHICH THESE TERMS AND CONDITIONS APPLY. Third party Products that are sold as non-Picarro branded products, are covered by the original manufacturer's warranty and Seller makes no warranty, express or implied, regarding such products.

(e) This limited warranty will be void if the Product (a) has been altered, except by Seller or by Buyer with Seller's prior written approval, (b) has not been installed and used in accordance with the Specifications, (c) has been subjected to abnormal physical or electrical stress, abnormal environmental conditions, misuse, negligence, or accident; (d) is licensed for beta, evaluation, testing or demonstration purposes. Seller's warranty remedy obligations do not extend to recovery or replacement of any data from any medium.

(f) Buyer agrees that the remedies provided by Seller for any breach of this warranty adequately protect Buyer's interests and expectations in the event it receives defective or non-conforming Products from Seller regardless of circumstances that may arise after Buyer agrees to these Terms and Conditions and when the Goods are used by Buyer or Buyer's customers.

9. RETURN OF PRODUCTS

Buyer may not return Products to Seller without first obtaining Seller's consent. Buyer must first submit a request for return with Seller and shall include P.O. number, approximate date shipped and any other identifying numbers (such as invoice number and date, etc.). Any request for return of Products for credit must state the type and quantity of Products, the part numbers and the reasons for the return. If return authorization is granted, Products shall be returned in Seller's original packaging materials. If original packaging materials are no longer available, Buyer shall contact Seller for packaging instructions. No credit allowance for defective Product will be made, nor will any replacement for any such Product be provided, unless the alleged defects are established to Seller's reasonable satisfaction after suitable testing and inspection. Buyer or Seller's local authorized partner will pay for shipping of the defective Product to Seller, and following repair of the Product Seller will pay for return shipment to Buyer or partner DDP (Incoterms 2020). Notwithstanding any defect or nonconformity, or any other matter, all risk of loss shall remain in Buyer until the Products are returned to Seller's manufacturing facility (Santa Clara, CA).

10. FULFILLMENT OF SELLER'S OBLIGATIONS

Seller may use local, authorized partners who have been trained by Seller in the installation, maintenance and repair of Products. Seller will remain responsible for the failure of any such authorized partner to fulfill Seller' obligations with respect to installation, repair and maintenance of the Product and will re-perform such obligations in the event Seller's authorized partner does not complete such obligation to Buyer's satisfaction. The use of any such authorized partner will not be considered a subcontract or assignment of Seller's obligations hereunder.

11. BANKRUPTCY OR INSOLVENCY OF BUYER

If the financial conditions of the Buyer at any time is such as to give Seller, in its reasonable judgment, grounds for insecurity concerning Buyer's ability to perform its obligations under this agreement, Seller may in its sole discretion: (a) by notice in writing to Buyer, cancel this agreement, without judicial intervention or declaration of default of Buyer and without prejudice to any right or remedy which may have accrued or may accrue thereafter to Seller, (b) require full or partial payment in advance and suspend any further deliveries or continuance of any work to be performed by Seller until such payment has been received; or (c) make all shipments to Buyer C.O.D.

12. PATENT INFRINGEMENT

(a) Except as set forth herein, Seller will defend Buyer at Seller's expense against any claim that any standard Product furnished hereunder constitutes an infringement of any United States Patent. Buyer shall notify Seller promptly in writing of any such claim and shall give Seller full authority, information and assistance in settling and/or defending such claim. Seller shall have no liability whatsoever with respect to any claims settled by Buyer without Seller's prior written consent. Likewise, Seller shall have no liability to Buyer if any claim of patent infringement is based upon Seller's compliance with Buyer's designs, instructions or specifications or Buyer's use of the Product: i) after modification by any person other than Seller; ii) in combination with equipment or devices not made by Seller; or iii) in a manner for which the Product was not designed.

(b) In case a Product furnished by Seller is held in and of itself to be an infringement and its use is enjoined, Seller, within a reasonable time, shall, at its option, either: (i) secure for Buyer the right to continue using the Product by suspension of the injunction by procuring for Buyer a license or by some other means; (ii) at Seller's expense, replace the enjoined Product with non-infringing goods; or (iii) remove the enjoined Product and refund to Buyer the sums paid therefore. The foregoing states the entire liability of Seller with respect to infringement of patents by the Products or any part thereof or by their operation. Provided however, Seller shall have no obligation with respect to any equipment, device or parts specified by Buyer but not manufactured by Seller.

THE FOREGOING STATES SELLER'S ENTIRE LIABILITY AND OBLIGATION (EXPRESS, STATUTORY, IMPLIED OR OTHERWISE) WITH RESPECT TO ANY CLAIMS OF INTELLECTUAL PROPERTY INFRINGEMENT.

13. SELLER'S PROPRIETARY RIGHTS

The sale of the Products to Buyer shall in no way be deemed to confer upon Buyer any right, interest or license in any patents or patent applications, trademarks or copyrights of the Seller. Seller retains for itself all proprietary rights in and to all designs, engineering details, and other data and materials pertaining to any Products supplied by Seller and to all discoveries, inventions, patents and other proprietary rights arising out of the work done by Seller in connection with the Products or with any products developed by Seller as a result thereof

14. APPLICABLE LAW, JURISDICTION AND VENUE, ATTORNEY'S FEES AND COSTS

This agreement will be governed by the laws of the State of California. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this agreement. The California state courts of Santa Clara County, California (or if there is exclusive federal jurisdiction, the United States District Court for the Northern District of California) will have exclusive jurisdiction over and be the sole venue for the resolution of any dispute arising out of this agreement, and Buyer hereby consents to the jurisdiction of such courts.

15. LIMITATION OF LIABILITY

SELLER'S LIABILITY UNDER, FOR BREACH OF, OR OTHERWISE ARISING OUT OF THIS AGREEMENT AND/OR THE SALE OF PRODUCTS WILL BE LIMITED TO REPAIR OR REPLACEMENT OF ANY DEFECTIVE OR NON-CONFORMING PRODUCT OR A REFUND OF THE PURCHASE PRICE OF THE PRODUCT, AT SELLER'S SOLE OPTION. BUYER AGREES THAT SELLER SHALL IN NO EVENT BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL OR OTHER DAMAGES, INCLUDING WITHOUT LIMITATION PERSONAL INJURY TO ANY PERSON OR ENTITY INCLUDING, WITHOUT LIMITATION, LOSS OF PROFIT, PLANT, EQUIPMENT, INFORMATION, PROPERTY OR PRODUCTION, ARISING FROM THE MANUFACTURE, SALE, PURCHASE, RESALE, REPAIR OR USE OF PRODUCTS AND FROM ANY PROMISE OR OFFER TO SELL, PURCHASE OR REPAIR PRODUCTS, REGARDLESS OF WHETHER OR NOT SELLER HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. THIS LIMITATION OF LIABILITY WILL APPLY REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT OR TORT, INCLUDING NEGLIGENCE. BUYER AGREES THAT THIS LIMITATION OF DAMAGES IS REASONABLE AND WILL NOT CAUSE IT TO LOSE ANY EXPECTED BENEFITS, RIGHTS OR REMEDIES UNDER ANY AGREEMENT FOR THE SALE OF PRODUCTS. THE ESSENTIAL PURPOSE OF THIS PROVISION IS TO LIMIT THE POTENTIAL LIABILITY OF SELLER FOR CLAIMS ARISING OUT OF THIS AGREEMENT AND/OR THE SALE OF PRODUCTS.

16. DELAYS BEYOND SELLER'S CONTROL

Seller will not be liable for any loss, damages or penalty resulting from delay in delivery of the Products when such delay is due to causes beyond the reasonable control of Seller, including without limitation, supplier delay, force majeure, act of God, labor unrest, fire, explosion or earthquake. In any such event, the delivery date will be deemed extended for a period equal to the delay. Seller will attempt to meet shipment schedules. However, any shipment quotation or forecast on an order acknowledgment is only an estimate of the time required to make shipment, and Seller hereby expressly disclaims all liability, for any losses, consequential or otherwise, because of any delay or failure to deliver all or any part of any order for any reason. Seller reserves the right to allocate inventories and current production in any way it deems desirable.

FORM **NFP 102.10**
ARTICLES OF INCORPORATION
General Not For Profit Corporation Act
File # **73664802**
Filing Fee: $50
Approved By: MJE

FILED
MAR 09 2022
Jesse White
Secretary of State

Article 1.
Corporate Name: LAKE COUNTY ENVIRONMENTAL WORKS

Article 2.
Registered Agent: TEUTA TANAKA

Registered Office: 2566 HERON DR

LINDENHURST IL 60046-8521 LAKE COUNTY

Article 3.
The first Board of Directors shall be 3 in number, their Names and Addresses being as follows

TEUTA TANAKA 2566 HERON DR. LINDENHURST, IL 60046

JOHN ALDRIN 4275 CHATHAM AVE. GURNEE IL 60031

FRANCESCA RACETTE 4868 KINGS WAY W. GURNEE IL 60031

Article 4. Purpose(s) for which the Corporation is organized:
Charitable.

Is this Corporation a Condominium Association as established under the Condominium Property Act? ☐ Yes ☑ No
Is this a Cooperative Housing Corporation as defined in Section 216 of the Internal Revenue Code of 1954? ☐ Yes ☑ No
Is this Corporation a Homeowner's Association, which administers a common-interest community as defined in subsection (c) of Section 9-102 of the code of Civil Procedure? ☐ Yes ☑ No

Article 5. Name & Address of Incorporator
The undersigned incorporator hereby declares, under penalties of perjury, that the statements made in the foregoing Articles of Incorporation are true.

TEUTA TANAKA
Name

2566 HERON DR.
Street

LINDENHURST, IL 60046
City, State, ZIP

Dated MARCH 09 , 2022
Month & Day Year

This document was created electronically at www.ilsos.gov

IRS DEPARTMENT OF THE TREASURY
INTERNAL REVENUE SERVICE
CINCINNATI OH 45999-0023

Date of this notice: 02-17-2022

Employer Identification Number:
88-0750336

Form: SS-4

Number of this notice: CP 575 E

LAKE COUNTY ENVIRONMENTAL WORKS
% TEUTA TANAKA
2566 HERON DR
LINDENHURST, IL 60046

For assistance you may call us at:
1-800-829-4933

IF YOU WRITE, ATTACH THE
STUB AT THE END OF THIS NOTICE.

WE ASSIGNED YOU AN EMPLOYER IDENTIFICATION NUMBER

Thank you for applying for an Employer Identification Number (EIN). We assigned you EIN 88-0750336. This EIN will identify your entity, accounts, tax returns, tax returns, and documents, even if you have no employees. Please keep this notice in your permanent records.

Taxpayers request an EIN for business and tax purposes. Some taxpayers receive CP575 notices when another person has stolen their identity and are operating using their information. If you did **not** apply for this EIN, please contact us at the phone number or address listed on the top of this notice.

When filing tax documents, making payments, or replying to any related correspondence, it is very important that you use your EIN and complete name and address exactly as shown above. Any variation may cause a delay in processing, result in incorrect information in your account, or even cause you to be assigned more than one EIN. If the information is not correct as shown above, please make the correction using the attached tear-off stub and return it to us.

When you submitted your application for an EIN, you checked the box indicating you are a non-profit organization. Assigning an EIN does not grant tax-exempt status to non-profit organizations. Publication 557, Tax-Exempt Status for Your organization, has details on the application process, as well as information on returns you may need to file. To apply for recognition of tax-exempt status, organizations must complete an application on one of the following forms: Form 1023, Application for Recognition of Exemption Under Section 501(c)(3) of the Internal Revenue Code; Form 1023-EZ, Streamlined Application for Recognition of Exemption Under Section 501(c)(3) of the Internal Revenue Code; Form 1024, Application for Recognition Under Section 501(a); or Form 1024-A, Application for Recognition of Exemption Under Section 501(c)(4) of the Internal Revenue Code.

Nearly all organizations claiming tax-exempt status must file a Form 990-series annual information return (Form 990, 990-EZ, or 990-PF) or notice (Form 990-N) beginning with the year they legally form, even if they have not yet applied for or received recognition of tax-exempt status.

If you become tax-exempt, you will lose tax-exempt status if you fail to file a required return or notice for three consecutive years, unless a filing exception applies to you (search www.irs.gov for Annual Exempt Organization Return: Who Must File). We start calculating this three-year period from the tax year we assigned the EIN to you. If that first tax year isn't a full twelve months, you're still responsible for submitting a return for that year. If you didn't legally form in the same tax year in which you obtained your EIN, contact us at the phone number or address listed at the top of this letter. For the most current information on your filing requirements and other important information, visit www.irs.gov/charities.

(IRS USE ONLY) 575E 02-17-2022 LAKE O 9999999999 SS-4

IMPORTANT REMINDERS:

* Keep a copy of this notice in your permanent records. This notice is issued only one time and the IRS will not be able to generate a duplicate copy for you. You may give a copy of this document to anyone asking for proof of your EIN.

* Use this EIN and your name exactly as they appear at the top of this notice on all your federal tax forms.

* Refer to this EIN on your tax-related correspondence and documents.

* Provide future officers of your organization with a copy of this notice.

Your name control associated with this EIN is LAKE. You will need to provide this information along with your EIN, if you file your returns electronically.

Safeguard your EIN by referring to Publication 4557, Safeguarding Taxpayer Data: A Guide for Your Business.

You can get any of the forms or publications mentioned in this letter by visiting our website at www.irs.gov/forms-pubs or by calling 800-TAX-FORM (800-829-3676).

If you have questions about your EIN, you can contact us at the phone number or address listed at the top of this notice. If you write, please tear off the stub at the bottom of this notice and include it with your letter.

Thank you for your cooperation.

Keep this part for your records. CP 575 E (Rev. 7-2007)

Return this part with any correspondence so we may identify your account. Please correct any errors in your name or address.

CP 575 E

9999999999

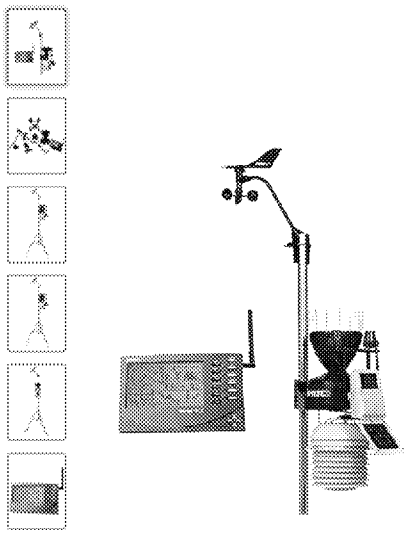
Your Telephone Number
( ) -
_____

Best Time to Call
_____

DATE OF THIS NOTICE: 02-17-2022
EMPLOYER IDENTIFICATION NUMBER: 88-0750336
FORM: SS-4 NOBOD

INTERNAL REVENUE SERVICE
CINCINNATI OH 45999-0023

LAKE COUNTY ENVIRONMENTAL WORKS
% TEUTA TANAKA
2566 HERON DR
LINDENHURST, IL 60046



Roll over image to zoom in

Davis Instruments 6163 Vantage Pro2 Plus Wireless Weather Station with UV Sensor, Solar Radiation Sensor and 24-hr Fan-Aspirated Radiation Shield

Brand: Davis Instruments

46 ratings | 36 answered questions

Amazon's Choice for "davis weather station"

-30% $1,018.22

List Price: ~~$1,445.00~~

& FREE Returns

Pay $56.57/month for 18 months, interest-free upon approval for the Amazon Rewards Visa Card

Available at a lower price from other sellers that may not offer free Prime shipping.

Brand	Davis Instruments
Are Batteries Included	No
Item Dimensions LxWxH	24 x 12 x 19 inches
Power Source	Ac and/Or Dc
Display Type	LCD

About this item

- ACCURATE, RELIABLE & CUSTOMIZABLE: Professional wireless weather station with weather data updates every 2.5 seconds
- WIDE RANGE OF SENSORS: Measure rainfall, wind speed & direction, temperature, humidity, UV and solar radiation
- HIGH-QUALITY: Engineered to withstand scorching sun, corrosion, 200 mph winds, temperature extremes, and much more
- 24-HOUR FAN-ASPIRATED RADIATION SHIELD: Combines passive shielding with a solar-powered fan that draws outside air in over the sensors
- INCLUDES: Wireless integrated sensor suite, console with backlit LCD screen (mounting pole/tripod not included)

Specifications for this item

Brand Name	Davis Instruments
Color	Black

$1,018.22

& FREE Returns

FREE delivery **Monday, March 28**

Or fastest delivery **Thursday, March 24**. Order within 8 hrs 36 mins

Select delivery location

Only 4 left in stock - order soon.

Qty: 1

Add to Cart

Buy Now

Secure transaction

Ships from Amazon
Sold by stores123
Packaging Shows what's inside. T...

Details

Return policy: Eligible for Return, Refund or Replacement

Support: Free Amazon product support included

prime

Enjoy fast, FREE delivery, exclusive deals and award-winning movies & TV shows with Prime

Try Prime and start saving today with **Fast, FREE Delivery**

Add a gift receipt for easy returns

Add to List

Compare New (46) from
$995.99
& **FREE Shipping**

Share

Display Type	LCD
Ean	0011698007479
Global Trade Identification Number	00040460296025
Item Weight	14.50 pounds
Material	Plastic

See more

See more product details

New (46) from $995.99 & **FREE Shipping**

Other Sellers on Amazon

$1,083.88 Add to Cart
& **FREE Shipping**
Sold by: Lifeline Brands

$1,097.42 Add to Cart
& **FREE Shipping**
Sold by: Prime Marine

$1,270.65 Add to Cart
& FREE Shipping. Details
Sold by: Amazon.com

Have one to sell?
Sell on Amazon

Frequently bought together

Total price: $1,384.74
Add all three to Cart

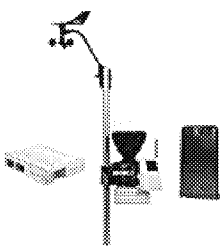
Some of these items ship sooner than the others. Show details

- **This item:** Davis Instruments 6163 Vantage Pro2 Plus Wireless Weather Station with UV Sensor, Solar Rad
- Davis Instruments 6100 WeatherLink Live | Wireless Data Collection Hub for Vantage Vue / Pro2 Weather
- Davis Instruments 6510USB WeatherLink USB Data Logger and Software for Windows $168.52

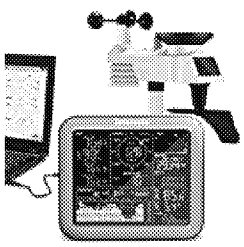
Products related to this item

Page 1 of 105

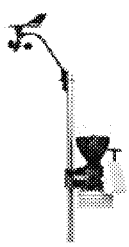
Sponsored



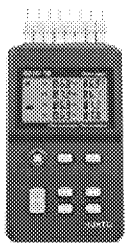
Davis Instruments Vantage Pro2 Weather Station, WeatherLink Live, and AirLink Air Q...
$895.00
FREE delivery: **March 28 - 31**



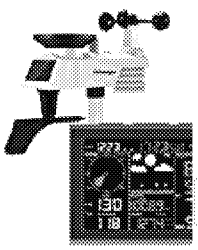
Sainlogic Wireless Weather Station with Outdoor Sensor, Weather Forecast,...
76
$149.99
FREE delivery: **Friday, April 1**



Davis Instruments 6820C Vantage Pro2 GroWeather Cabled Sensor Suite Weather...
$670.00
FREE delivery: **March 28 - 31**

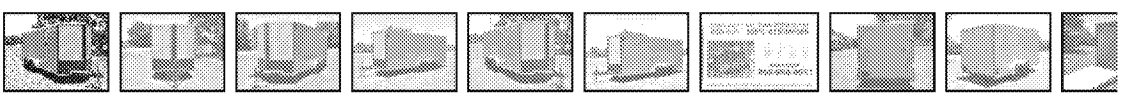


HUATO S220-T8 Eight Channel Thermocouple Data Logger with External Power Supply...
22
$368.00
FREE delivery: **Monday, March 28**



Sainlogic Wireless Weather Station witl Outdoor Sensor, 8-ir Weather Station witl
1,731
$139.99
FREE delivery: **Monday, March 28**

7×16 Enclosed Trailer – 764



To receive *MORE INFORMATION* on this trailer please use the form belo

Name (*):

Phone:

Email: (*)

Yes, I'm interested in this trailer, please tell me more about it.

SUBMIT

Have questions? We're happy to answer your questions.
Call us today at 800-998-9051!!

THIS TRAILER and ***ALL ATP TRAILERS*** are now available in either the ***XTRA TUFF SERIES*** (the manufacturer's conventional frame) or the ***ELITE SERIES*** (an all tube frame).

*** Our manufacturers are now using precision-engineered panels in the decks and walls of their enclosed trailers. These high-performance OSB panels are manufactured specifically for cargo trailers to withstand recurring impacts, twisting, cupping, cracking and warping. Your trailer may be built with either plywood or OSB solely based on the material available to the factory at the time your trailer is built. ****

It's your choice, order your enclosed trailer built the way you want it!!

Title: 7×16 Enclosed Trailer – 764

Description:

7×16 Enclosed Trailer – Trailer #764

7x16TA Silver-Mist With Black Anodized Tread Plate Trim

Our All Tube Frame Trailers Are True Commercial Grade. Combine All Tube Framed With A Wrapped Roof, And You Have A Cargo Trailer Beyond Compare!
At A Price That Can't Be Beat!

American Trailer Pros's Stronger, Straighter Frame Tows Better!! **Call us today at 800-998-9051**

D&A CUSTOM'S 7X16TA ENCLOSED TRAILER STANDARD FEATURES:
* ALL TUBE CONSTRUCTION * .030 GALVALUME EXTERIOR * WRAPPED GALVALUME ROOF

The Standard Features Aren't Too Shabby Either!!!

American Trailer Pros's D&A 7×16 Tandem Enclosed Trailer Standard Features:

1.) V-nose Front With Solid Wall Construction
2.) Rear Ramp Door & Spring Assist
3.) 32" Side Door W/ Bar Lock
4.) LED Tail Lights
5.) Thermacool Ceiling
6.) Interior 12 Volt Dome Light With Switch
7.) Rear Tag Light
8.) ATP Stoneguard Front
9.) ATP Stoneguard Strip Up Point Of V-nose
10.) (2) 3500 LB. 4" Drop Leaf Spring Axles With Electric Brakes On Both Axles
11.) E-Z Lube Hub Axles
12.) Aluminum Tear Drop Fenders
13.) New St205 15 Tires
14.) Modular Wheels
15.) Semi-Screwed Exterior
16.) .030 Galvalume Exterior Finish
17.) Heavy Duty Exterior Trim
18.) Galvalume Roof
19.) High Tech Roof Sealant
20.) Perimeter Frame
21.) 1 & 1/2" X 1" Square Steel Tubing Wall & Ceiling Frame

Add A Row Of E-track On Each Side Wall & Four D-Rings In The Floor And There's Nothing You Can't Haul!!!

Call The Trailer Pros Today, We're Happy To Help! Call Jon, JC, Bill, Marshall, Mercedes, Jay, Nan Or Edward Today!
800-998-9051

To receive *MORE INFORMATION* on this trailer please use the form below.

Name (*):

Phone:

Email: (*)

Yes, I'm interested in this trailer, please tell me more about it.

SUBM

Have questions? We're happy to answer your questions.
Call us today at 800-998-9051!!

Year :	2022
Size :	7X16
Width :	7
Length :	16
Make :	D&A CUSTOM
Model :	7X16TA
Stock :	STOCK MODEL
Serial :	ORDER
Extcolor :	SILVER MIST
Axles :	2
Hitch :	BUMPER PULL
Rear :	RAMP
Side Door :	YES
Condition :	NEW
Features :	TOO MANY TO LIST
Warranty :	FACTORY WARRANTY
Phone :	800-998-9051
State :	Sold / Delivery Available In All States
Sold :	ORDER

1

Add to cart

Price: $ 6982

Trailer dimensions, weights and measurements will vary due to manufacturing and production changes. All specifications and measurements are subject to change. Please verify the actual measurements of any unit prior to purchasing it. The trailer photo displayed may be an example only. Pricing throughout the website may not include any options that may have been installed at the dealership. Read your estimate to verify the final price. Some trailers shown with optional equipment. See the actual trailer for complete accuracy of features, options & pricing. Some trailer images shown are stock photos and may not reflect your exact choice of vehicle, color, trim and specification. The trailer pictures on this site may not match your trailer exactly; however, it will match as closely as possible. Not responsible for pricing or typographical errors.

Roberts, Timothy-P

From: AirMonitoring
Sent: Friday, April 08, 2022 10:02 AM
To: 'Tea Tanaka'; AirMonitoring
Cc: Thompson, Ashley; Dowdell, Edward (Ned); John Aldrin; Tea Tanaka; Mocka, Corey
Subject: RE: Grant application question

Tea – After reviewing your tickets, we are pleased to notify you that we may accept the submittal of your application outside of Grants.gov. Please note that we are still reviewing all applications against the threshold requirements in Section III.C. of the RFA, and this is not an acknowledgement that your application meets these requirements. We will notify you separately if we deem your application is ineligible based on any of the requirements under this section of the RFA.

Feel free to contact us if you have any questions. Thanks.

Tim Roberts
Acting Team Leader/JRO
Acquisition Policy Team
OAR, Office of Program Management Operations
U.S. Environmental Protection Agency
202-564-6004
roberts.timothy-p@epa.gov

From: Tea Tanaka <tboci3@gmail.com>
Sent: Tuesday, April 05, 2022 9:38 AM
To: AirMonitoring <AirMonitoring@epa.gov>
Cc: Thompson, Ashley <Thompson.Ashley.M@epa.gov>; Dowdell, Edward (Ned) <Dowdell.Ned@epa.gov>; John Aldrin <j_aldrin@yahoo.com>; Tea Tanaka <tea.stopeto@gmail.com>
Subject: Re: Grant application question

4/5/22 update on SAM account:

I called FSD this morning to inquire on the status of both tickets. John Aldrin's ticket is on hold, they are waiting for him to call them back. John is out of the country at the moment.

My ticket was closed after a change was made on their side (not clear on what that change is). Now, when I log into my SAM account, I do see the "ID assigned" tab active, which it was not previously. I clicked on it to validate the entity. Because the entity was not found from the search, I had to submit an incident. I attached evidence to prove the entity name & address - for validation purposes. That incident number is now "**INC-GSAFSD5929847 - User Question on Pending UEI Validation**". I am guessing once the information is verified, I can proceed with registration.

Thanks,
Tea

On Tue, Apr 5, 2022 at 7:59 AM Tea Tanaka <tboci3@gmail.com> wrote:

Hello,

sorry for the late reply, I was out on vacation.

Yes, both FSD tickets were elevated to Tier 2 as of 3/25/22; Aldrin ticket # INC-GSAFSD5884956 and Tanaka ticket # INC-GSAFSD5891361. I attached all the information we had about this ticket in pdf titled "Transmission difficulties" with the rest of the application docs. I am attaching it here again.

I will call them this morning to inquire about the status of my ticket. John Aldrin is still out of the country on vacation and cannot call about his ticket this week.

Thank you,
Tea

On Fri, Apr 1, 2022 at 12:46 PM AirMonitoring <AirMonitoring@epa.gov> wrote:

Tea – To help us look into the issues you encountered, can you please send us the FSD ticket you referenced? Thank you.

Tim Roberts

Acting Team Leader/JRO

Acquisition Policy Team

OAR, Office of Program Management Operations
U.S. Environmental Protection Agency
202-564-6004
roberts.timothy-p@epa.gov

From: Tea Tanaka <tboci3@gmail.com>
Sent: Tuesday, March 29, 2022 10:43 PM
To: AirMonitoring <AirMonitoring@epa.gov>
Cc: Thompson, Ashley <Thompson.Ashley.M@epa.gov>; Dowdell, Edward (Ned) <Dowdell.Ned@epa.gov>; John Aldrin <j_aldrin@yahoo.com>; Tea Tanaka <tea.stopeto@gmail.com>
Subject: Re: Grant application question

Hi Tim,

Thanks for the receipt. Looking forward to hearing back about status of application.

Best regards!

Tea

On Tue, Mar 29, 2022, 06:19 AirMonitoring <AirMonitoring@epa.gov> wrote:

Tea – Thank you for contacting us regarding difficulty submitting your grant application in response to the Enhanced Air Quality Monitoring for Communities grant competition. This email acknowledges receipt of your request to submit your application outside of Grants.gov.

We will notify you soon as to whether we will accept your application being submitted outside of Grants.gov, consistent with Appendix A of the RFA.

Tim Roberts

Acting Team Leader/JRO

Acquisition Policy Team

OAR, Office of Program Management Operations
U.S. Environmental Protection Agency
202-564-6004
roberts.timothy-p@epa.gov

From: Tea Tanaka <tboci3@gmail.com>
Sent: Friday, March 25, 2022 11:54 PM
To: AirMonitoring <AirMonitoring@epa.gov>
Cc: Thompson, Ashley <Thompson.Ashley.M@epa.gov>; Dowdell, Edward (Ned) <Dowdell.Ned@epa.gov>; John Aldrin <j_aldrin@yahoo.com>; Tea Tanaka <tea.stopeto@gmail.com>
Subject: Re: Grant application question

Hello Tim and everyone,

Thank you for all your help. Between yesterday and today, we have been on the phone with the Federal Service Desk several times. John was successful in eventually getting me added as a role in sam,gov under our entity, so I could finish the process. Unfortunately, once I took hold of the entity registration, I stumbled on the same exact error as John experienced. I initiated another ticket with FSD. Both our tickets were elevated to Tier 2. However, as of today, an agent still needs to be assigned to our tickets. I summarized everything in a pdf doc I titled "Transmission difficulties" attached here.

Thank you for accepting our application outside the system. Please see all relevant documents attached to this email.

Thank you in advance for your help.

Sincerely,

Teuta (Tea) Tanaka

On Thu, Mar 24, 2022 at 8:20 AM AirMonitoring <AirMonitoring@epa.gov> wrote:

> Tea – You should also contact the SAM service desk and provide them the ticket number. Let them know that you are registering so you can apply for a grant competition that closes tomorrow and they can hopefully expedite the ticket. If you are unable to resolve the issue, be sure to email us tomorrow your full application in PDF format, document the issues, and provide all SAM and Grants.gov ticket numbers. Appendix A on pages 27-28 of the RFA further explain this process for submitting your application outside of Grants.gov.
>
> I hope you are able to resolve the registration issue.
>
> Tim Roberts
>
> Acting Team Leader/JRO
>
> Acquisition Policy Team
>
> OAR, Office of Program Management Operations
> U.S. Environmental Protection Agency
> 202-564-6004
> roberts.timothy-p@epa.gov
>
> ---
>
> **From:** Tea Tanaka <tboci3@gmail.com>
> **Sent:** Thursday, March 24, 2022 12:01 AM
> **To:** AirMonitoring <AirMonitoring@epa.gov>; Thompson, Ashley <Thompson.Ashley.M@epa.gov>; Dowdell, Edward (Ned) <Dowdell.Ned@epa.gov>
> **Cc:** John Aldrin <j_aldrin@yahoo.com>
> **Subject:** Re: Grant application question
>
> Hi everyone,

I am writing again asking for your help with another technical issue we ran into; this time with SAM.gov

Since we last communicated, we established a 501c3 entity titled Lake County Environmental Works (LCEW). We got the EIN for the entity (# 88-0750336), registered the entity with the State of IL, got the DUNS ID (118607136) and SAM ID (S6HAU593KB79), and set up a bank account for the entity.

John Aldrin, Director of LCEW, was in the process of registering the entity under his account on sam.gov when he got an error message from the system. The website wasn't allowing him to update toggle actions on LCEW. The error read: "*There is an issue with the status of your entity registration. Please contact the Federal Service Desk*." (see attached screenshots at the bottom of this email). John called Service Desk today to resolve the issue, but they were unsuccessful. There was a ticket created for it # INC-GSAFSD5884956 with Ref: MSGPROD18834172_ulhSPJNKYKigIa1

The problem is John will be out of the country starting Thursday 3/24/22. He will not be able to follow up with the Service Desk on this technical issue until he returns back in the country, which will be past the grant's deadline.

I created a login ID in the system myself, to see if I could continue the SAM registration under my account instead. The system didn't let me create a new SAM ID; it recognizes the previous SAM ID that John created. John cannot delete the entity from his account either.

All our forms, grant application, all required attachments, and bank information are ready for submission to this grant. But it seems the system isn't cooperating with us.

Hence the purpose of my email. I am trying to see what other avenues are there to submit for this grant.

Could we submit via email or FedEx instead? If not, would it be possible to get an extension, so we could resolve the technical issue with Service Desk?

We're trying to think outside the box here. Our EJ communities desperately need to know the quality of the air we're breathing in Lake County, IL. This grant is our Hail Mary to get some conclusive data on our environmental issue.

We thank you all very much in advance for your help and hope to get this resolved.

Sincerely,

Tea Tanaka

Screenshot 1 - showing the entity DUNS and SAM ID:

Screenshot 2 - showing SAM Entity Registration error:

On Fri, Feb 25, 2022 at 9:04 AM AirMonitoring <AirMonitoring@epa.gov> wrote:

I'm glad this worked out and thanks for letting us know.

Tim Roberts

Acting Team Leader/JRO

Acquisition Policy Team

OAR, Office of Program Management Operations
U.S. Environmental Protection Agency
202-564-6004
roberts.timothy-p@epa.gov

From: Tea Tanaka <tboci3@gmail.com>
Sent: Thursday, February 24, 2022 1:28 PM
To: AirMonitoring <AirMonitoring@epa.gov>
Cc: John Aldrin <j_aldrin@yahoo.com>; Thompson, Ashley <Thompson.Ashley.M@epa.gov>; Dowdell, Edward (Ned) <Dowdell.Ned@epa.gov>
Subject: Re: Grant application question

Hi everyone,

Yes, I created a new org and got the EIN number quickly for it. I'm not sure what the previous issue was.

Thank you very much for your help.

Best regards,

Tea

On Thu, Feb 24, 2022, 08:33 AirMonitoring <AirMonitoring@epa.gov> wrote:

> Tea – Have you tried a new application for the EIN? Based on the screenshot, it looks like some of the info you provided is preventing you from applying for an EIN through the online application. If the information for the responsible party matches IRS records, then you should be able to use the online system.
>
> Tim Roberts
>
> Acting Team Leader/JRO
>
> Acquisition Policy Team
>
> OAR, Office of Program Management Operations
> U.S. Environmental Protection Agency
> 202-564-6004
> roberts.timothy-p@epa.gov

From: Tea Tanaka <tboci3@gmail.com>
Sent: Thursday, February 17, 2022 3:00 PM
To: AirMonitoring <AirMonitoring@epa.gov>
Cc: John Aldrin <j_aldrin@yahoo.com>; Thompson, Ashley <Thompson.Ashley.M@epa.gov>; Dowdell, Edward (Ned) <Dowdell.Ned@epa.gov>
Subject: Re: Grant application question

Thank you for your quick response.

Yes, the online EIN request was attempted online. Unfortunately, after I submitted, they gave us a 101 code and told us to call them (screenshot of that message attached here).

That number leads us to an automated message saying they've too many phonecalls and to attempt calling later. Needless to say, a few days of repeatedly trying hasn't helped...

I'll keep calling them.

Thank you,

Tea

On Thu, Feb 17, 2022, 12:38 AirMonitoring <AirMonitoring@epa.gov> wrote:

> Tea – Thank you for your interest in this competition. Have you tried the online EIN application (https://www.irs.gov/businesses/small-businesses-self-employed/how-long-will-it-take-to-get-an-ein)? This system can provide an EIN within a day. The backlog is more related to tax returns. Please let us know if the online application is not working properly, since you do need to be registered in SAM.gov in order to apply for a grant through Grants.gov and SAM requires a TIN to register. You should have enough time before the March 25 grant competition to get register. If it seems there are delays, please let us know so we can look into options.
>
> Tim Roberts
>
> Acting Team Leader/JRO
>
> Acquisition Policy Team
>
> OAR, Office of Program Management Operations
> U.S. Environmental Protection Agency

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From: Tea Tanaka <tboci3@gmail.com>
Sent: Thursday, February 17, 2022 11:01 AM
To: AirMonitoring <AirMonitoring@epa.gov>
Cc: John Aldrin <j_aldrin@yahoo.com>
Subject: Grant application question

Hello,

Our team in Lake County, IL is interested in applying for the EPA ARP grant (submission due 3/25/22). We are in dire need of funding to do air monitoring for Ethylene oxide emissions here.

We've hit a snag as we're navigating the IRS process obtain an EIN number for our new 501(c)3 organization. The problem is the IRS has currently an unusually long process time. News reports say they are months behind.

We may/may not be able to obtain an EIN number by the time the ARP grant comes due.

Our questions to you are:

1) Would we be eligible to apply even if the IRS process is underway?

2) Could we apply as a citizen group without needing to be a 501c3 at all?

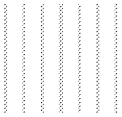
3) What other options do we have to apply for ARP grant?

Thank you in advance for your help.

Respectfully,

Tea Tanaka

P.S. My colleague, John Aldrin, is cc-ed in this email. Please reply all to include him.



1.0 Quality Policy Statement

Lake County Environmental Works (LCEW), a community based group, will rely on existing best practices that have been previously defined for TO-15/TO-15A canister testing for ethylene oxide [1].

2.0 Organization and Management Structure

The technical point-of-contact (TPOC) will manage the test plan, test performance, data review process.

A Quality Assurance Officer in LCEW will be responsible for implementing and overseeing the quality system and reviewing and approving any changes to the quality manual and associated quality documentation.

Guidance and auditing will be provided by team members and university partners with decades of experience in QA for chemical testing and air quality measurement.

3.0 Ethics Policy and Data Integrity

LCEW has developed an ethics policy and established procedures to educate and train personnel in their ethical and legal responsibilities. LCEW performs routine data review to ensure the records are complete and that they demonstrate ethical conduct. Data integrity procedures are part of this quality manual. The ethics agreement defines the organizations' ethical and legal responsibilities including the potential punishments and penalties for improper, unethical or illegal actions.

4.0 Document Control

All data will be freely shared online, with the Lake County Health Department, as in past Phase I-III testing periods [2], and with other organizations with interest in community trends concerning ethylene oxide levels.

5.0 Subcontracting Sample Analysis and Review of New Work

Any subcontracting of work for regulatory reporting shall be subcontracted to laboratories accredited under ORELAP whenever possible. A chain of custody form will be used to track samples from air quality sampling activities to the subcontract laboratory. The chain of custody lists the tests requested for analysis.

All new work is initiated by the TPOC who delegates responsibilities for the new work according to available resources. The team will meet prior to initiation of new work in order to determine if appropriate facilities and resources are available. The plan for any new testing shall be reviewed and approved by the team before commencing such work. After agreement is reached, facilities and resources are organized to efficiently perform the work. For any new testing requirements, the designated employee shall write a standard operating procedure and demonstrate capability to perform those tests prior to reporting results. The SOP(s) shall be under document control, and a Demonstration of Capability Statement(s)shall be on file.

6.0 Reporting the Results

The analyst performing the analysis verifies all data. The data review is to include the following items:

- Calibration of the instrumentation. (Confirm the calibration criteria are met.)
- Quality control data. (Confirm QC meets the acceptance criteria.)
- Calculations. (Check for calculation errors.)
- Documentation. (Check worksheets, logbooks and printouts for accuracy and completeness.)

Before final reporting is done, data are validated by the TPOC and QAO to verify that all quality control measures are reviewed and evaluated and to ensure the reported data are free from transcription and calculation errors.

7.0 Data Dissemination Plan

All data will be freely shared online, with the Lake County Health Department, as in past Phase I-III testing periods [2], and with other organizations with interest in community trends concerning ethylene oxide levels.

8.0 References

[1] US EPA. "Method TO-15: Determination of volatile organic compounds (VOCs) in air collected in specially-prepared canisters and analyzed by gas chromatography/mass spectrometry (GC/MS)." EPA/625/R-96/010b (1999).

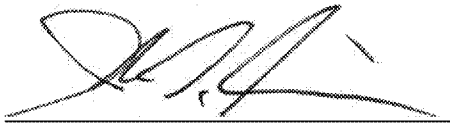
[2] Ethylene Oxide Air Monitoring Results, Lake County IL. https://www.lakecountyil.gov/4188/EtO-Monitoring-Results. Raw data: https://docs.google.com/spreadsheets/d/1mrY1MbFWUT5-ysl7SpD74CKMKOMo4x9i5wZAArdYJ2k/edit#gid=1269948513 .

[3] American Society for Quality Control (ASQC), Definitions of Environmental Quality Assurance Terms, 1996.

[4] National Environmental Laboratory Accreditation Conference (NELAC), 2003 Standards.

Signature Page

Technical Point of Contact — John C. Aldrin



Signature

3/23/2022

Date

EPA/625/R-96/010b

Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air

Second Edition

Compendium Method TO-15

Determination Of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/ Mass Spectrometry (GC/MS)

Center for Environmental Research Information
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, OH 45268

January 1999

Method TO-15
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DISCLAIMER

METHOD TO-15

Determination of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/ Mass Spectrometry (GC/MS)

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METHOD TO-15

Determination of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/ Mass Spectrometry (GC/MS)

1. Scope

1.1 This method documents sampling and analytical procedures for the measurement of subsets of the 97 volatile organic compounds (VOCs) that are included in the 189 hazardous air pollutants (HAPs) listed in Title III of the Clean Air Act Amendments of 1990. VOCs are defined here as organic compounds having a vapor pressure greater than 10^{-1} Torr at 25°C and 760 mm Hg. Table 1 is the list of the target VOCs along with their CAS number, boiling point, vapor pressure and an indication of their membership in both the list of VOCs covered by Compendium Method TO-14A (1) and the list of VOCs in EPA's Contract Laboratory Program (CLP) document entitled: *Statement-of-Work (SOW) for the Analysis of Air Toxics from Superfund Sites (2).*

Many of these compounds have been tested for stability in concentration when stored in specially-prepared canisters (see Section 8) under conditions typical of those encountered in routine ambient air analysis. The stability of these compounds under all possible conditions is not known. However, a model to predict compound losses due to physical adsorption of VOCs on canister walls and to dissolution of VOCs in water condensed in the canisters has been developed (3). Losses due to physical adsorption require only the establishment of equilibrium between the condensed and gas phases and are generally considered short term losses, (i.e., losses occurring over minutes to hours). Losses due to chemical reactions of the VOCs with cocollected ozone or other gas phase species also account for some short term losses. Chemical reactions between VOCs and substances inside the canister are generally assumed to cause the gradual decrease of concentration over time (i.e., long term losses over days to weeks). Loss mechanisms such as aqueous hydrolysis and biological degradation (4) also exist. No models are currently known to be available to estimate and characterize all these potential losses, although a number of experimental observations are referenced in Section 8. Some of the VOCs listed in Title III have short atmospheric lifetimes and may not be present except near sources.

1.2 This method applies to ambient concentrations of VOCs above 0.5 ppbv and typically requires VOC enrichment by concentrating up to one liter of a sample volume. The VOC concentration range for ambient air in many cases includes the concentration at which continuous exposure over a lifetime is estimated to constitute a 10^{-6} or higher lifetime risk of developing cancer in humans. Under circumstances in which many hazardous VOCs are present at 10^{-6} risk concentrations, the total risk may be significantly greater.

1.3 This method applies under most conditions encountered in sampling of ambient air into canisters. However, the composition of a gas mixture in a canister, under unique or unusual conditions, will change so that the sample is known not to be a true representation of the ambient air from which it was taken. For example, low humidity conditions in the sample may lead to losses of certain VOCs on the canister walls, losses that would not happen if the humidity were higher. If the canister is pressurized, then condensation of water from high humidity samples may cause fractional losses of water-soluble compounds. Since the canister surface area is limited, all gases are in competition for the available active sites. Hence an absolute storage stability cannot be assigned to a specific gas. Fortunately, under conditions of normal usage for sampling ambient air, most VOCs can be recovered from canisters near their original concentrations after storage times of up to thirty days (see Section 8).

1.4 Use of the Compendium Method TO-15 for many of the VOCs listed in Table 1 is likely to present two difficulties: (1) what calibration standard to use for establishing a basis for testing and quantitation, and (2) how

to obtain an audit standard. In certain cases a chemical similarity exists between a thoroughly tested compound and others on the Title III list. In this case, what works for one is likely to work for the other in terms of making standards. However, this is not always the case and some compound standards will be troublesome. The reader is referred to the Section 9.2 on standards for guidance. Calibration of compounds such as formaldehyde, diazomethane, and many of the others represents a challenge.

1.5 Compendium Method TO-15 should be considered for use when a subset of the 97 Title III VOCs constitute the target list. Typical situations involve ambient air testing associated with the permitting procedures for emission sources. In this case sampling and analysis of VOCs is performed to determine the impact of dispersing source emissions in the surrounding areas. Other important applications are prevalence and trend monitoring for hazardous VOCs in urban areas and risk assessments downwind of industrialized or source-impacted areas.

1.6 Solid adsorbents can be used in lieu of canisters for sampling of VOCs, provided the solid adsorbent packings, usually multisorbent packings in metal or glass tubes, can meet the performance criteria specified in Compendium Method TO-17 which specifically addresses the use of multisorbent packings. The two sample collection techniques are different but become the same upon movement of the sample from the collection medium (canister or multisorbent tubes) onto the sample concentrator. Sample collection directly from the atmosphere by automated gas chromatographs can be used in lieu of collection in canisters or on solid adsorbents.

2. Summary of Method

2.1 The atmosphere is sampled by introduction of air into a specially-prepared stainless steel canister. Both subatmospheric pressure and pressurized sampling modes use an initially evacuated canister. A pump ventilated sampling line is used during sample collection with most commercially available samplers. Pressurized sampling requires an additional pump to provide positive pressure to the sample canister. A sample of air is drawn through a sampling train comprised of components that regulate the rate and duration of sampling into the pre-evacuated and passivated canister.

2.2 After the air sample is collected, the canister valve is closed, an identification tag is attached to the canister, and the canister is transported to the laboratory for analysis.

2.3 Upon receipt at the laboratory, the canister tag data is recorded and the canister is stored until analysis. Storage times of up to thirty days have been demonstrated for many of the VOCs (5).

2.4 To analyze the sample, a known volume of sample is directed from the canister through a solid multisorbent concentrator. A portion of the water vapor in the sample breaks through the concentrator during sampling, to a degree depending on the multisorbent composition, duration of sampling, and other factors. Water content of the sample can be further reduced by dry purging the concentrator with helium while retaining target compounds. After the concentration and drying steps are completed, the VOCs are thermally desorbed, entrained in a carrier gas stream, and then focused in a small volume by trapping on a reduced temperature trap or small volume multisorbent trap. The sample is then released by thermal desorption and carried onto a gas chromatographic column for separation.

As a simple alternative to the multisorbent/dry purge water management technique, the amount of water vapor in the sample can be reduced below any threshold for affecting the proper operation of the analytical system by

reducing the sample size. For example, a small sample can be concentrated on a cold trap and released directly to the gas chromatographic column. The reduction in sample volume may require an enhancement of detector sensitivity.

Other water management approaches are also acceptable as long as their use does not compromise the attainment of the performance criteria listed in Section 11. A listing of some commercial water management systems is provided in Appendix A. One of the alternative ways to dry the sample is to separate VOCs from condensate on a low temperature trap by heating and purging the trap.

2.5 The analytical strategy for Compendium Method TO-15 involves using a high resolution gas chromatograph (GC) coupled to a mass spectrometer. If the mass spectrometer is a linear quadrupole system, it is operated either by continuously scanning a wide range of mass to charge ratios (SCAN mode) or by monitoring select ion monitoring mode (SIM) of compounds on the target list. If the mass spectrometer is based on a standard ion trap design, only a scanning mode is used (note however, that the Selected Ion Storage (SIS) mode for the ion trap has features of the SIM mode). Mass spectra for individual peaks in the total ion chromatogram are examined with respect to the fragmentation pattern of ions corresponding to various VOCs including the intensity of primary and secondary ions. The fragmentation pattern is compared with stored spectra taken under similar conditions, in order to identify the compound. For any given compound, the intensity of the primary fragment is compared with the system response to the primary fragment for known amounts of the compound. This establishes the compound concentration that exists in the sample.

Mass spectrometry is considered a more definitive identification technique than single specific detectors such as flame ionization detector (FID), electron capture detector (ECD), photoionization detector (PID), or a multidetector arrangement of these (see discussion in Compendium Method TO-14A). The use of both gas chromatographic retention time and the generally unique mass fragmentation patterns reduce the chances for misidentification. If the technique is supported by a comprehensive mass spectral database and a knowledgeable operator, then the correct identification and quantification of VOCs is further enhanced.

3. Significance

3.1 Compendium Method TO-15 is significant in that it extends the Compendium Method TO-14A description for using canister-based sampling and gas chromatographic analysis in the following ways:

- Compendium Method TO-15 incorporates a multisorbent/dry purge technique or equivalent (see Appendix A) for water management thereby addressing a more extensive set of compounds (the VOCs mentioned in Title III of the CAAA of 1990) than addressed by Compendium Method TO-14A. Compendium Method TO-14A approach to water management alters the structure or reduces the sample stream concentration of some VOCs, especially water-soluble VOCs.
- Compendium Method TO-15 uses the GC/MS technique as the only means to identify and quantitate target compounds. The GC/MS approach provides a more scientifically-defensible detection scheme which is generally more desirable than the use of single or even multiple specific detectors.
- In addition, Compendium Method TO-15 establishes method performance criteria for acceptance of data, allowing the use of alternate but equivalent sampling and analytical equipment. There are several new and viable commercial approaches for water management as noted in Appendix A of this method on which to base a VOC monitoring technique as well as other approaches to sampling (i.e., autoGCs and solid

adsorbents) that are often used. This method lists performance criteria that these alternatives must meet to be acceptable alternatives for monitoring ambient VOCs.

- Finally, Compendium Method TO-15 includes enhanced provisions for inherent quality control. The method uses internal analytical standards and frequent verification of analytical system performance to assure control of the analytical system. This more formal and better documented approach to quality control guarantees a higher percentage of good data.

3.2 With these features, Compendium Method TO-15 is a more general yet better defined method for VOCs than Compendium Method TO-14A. As such, the method can be applied with a higher confidence to reduce the uncertainty in risk assessments in environments where the hazardous volatile gases listed in the Title III of the Clean Air Act Amendments of 1990 are being monitored. An emphasis on risk assessments for human health and effects on the ecology is a current goal for the U.S. EPA.

4. Applicable Documents

4.1 ASTM Standards

- **Method D1356** *Definitions of Terms Relating to Atmospheric Sampling and Analysis.*
- **Method E260** *Recommended Practice for General Gas Chromatography Procedures.*
- **Method E355** *Practice for Gas Chromatography Terms and Relationships.*
- **Method D5466** *Standard Test Method of Determination of Volatile Organic Compounds in Atmospheres (Canister Sampling Methodology).*

4.2 EPA Documents

- *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II*, U. S. Environmental Protection Agency, EPA-600/R-94-038b, May 1994.
- *Technical Assistance Document for Sampling and Analysis of Toxic Organic Compounds in Ambient Air*, U. S. Environmental Protection Agency, EPA-600/4-83-027, June 1983.
- *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air: Method TO-14, Second Supplement*, U. S. Environmental Protection Agency, EPA-600/4-89-018, March 1989.
- *Statement-of-Work (SOW) for the Analysis of Air Toxics from Superfund Sites*, U. S. Environmental Protection Agency, Office of Solid Waste, Washington, D.C., Draft Report, June 1990.
- *Clean Air Act Amendments of 1990,* U. S. Congress, Washington, D.C., November 1990.

5. Definitions

[Note: Definitions used in this document and any user-prepared standard operating procedures (SOPs) should be consistent with ASTM Methods D1356, E260, and E355. Aside from the definitions given below, all pertinent abbreviations and symbols are defined within this document at point of use.]

5.1 Gauge Pressure—pressure measured with reference to the surrounding atmospheric pressure, usually expressed in units of kPa or psi. Zero gauge pressure is equal to atmospheric (barometric) pressure.

5.2 Absolute Pressure—pressure measured with reference to absolute zero pressure, usually expressed in units of kPa, or psi.

5.3 Cryogen—a refrigerant used to obtain sub-ambient temperatures in the VOC concentrator and/or on front of the analytical column. Typical cryogens are liquid nitrogen (bp -195.8°C), liquid argon (bp -185.7°C), and liquid CO_2 (bp -79.5°C).

5.4 Dynamic Calibration—calibration of an analytical system using calibration gas standard concentrations in a form identical or very similar to the samples to be analyzed and by introducing such standards into the inlet of the sampling or analytical system from a manifold through which the gas standards are flowing.

5.5 Dynamic Dilution—means of preparing calibration mixtures in which standard gas(es) from pressurized cylinders are continuously blended with humidified zero air in a manifold so that a flowing stream of calibration mixture is available at the inlet of the analytical system.

5.6 MS-SCAN—mass spectrometric mode of operation in which the gas chromatograph (GC) is coupled to a mass spectrometer (MS) programmed to SCAN all ions repeatedly over a specified mass range.

5.7 MS-SIM—mass spectrometric mode of operation in which the GC is coupled to a MS that is programmed to scan a selected number of ions repeatedly [i.e., selected ion monitoring (SIM) mode].

5.8 Qualitative Accuracy—the degree of measurement accuracy required to correctly identify compounds with an analytical system.

5.9 Quantitative Accuracy—the degree of measurement accuracy required to correctly measure the concentration of an identified compound with an analytical system with known uncertainty.

5.10 Replicate Precision—precision determined from two canisters filled from the same air mass over the same time period and determined as the absolute value of the difference between the analyses of canisters divided by their average value and expressed as a percentage (see Section 11 for performance criteria for replicate precision).

5.11 Duplicate Precision—precision determined from the analysis of two samples taken from the same canister. The duplicate precision is determined as the absolute value of the difference between the canister analyses divided by their average value and expressed as a percentage.

5.12 Audit Accuracy—the difference between the analysis of a sample provided in an audit canister and the nominal value as determined by the audit authority, divided by the audit value and expressed as a percentage (see Section 11 for performance criteria for audit accuracy).

6. Interferences and Contamination

6.1 Very volatile compounds, such as chloromethane and vinyl chloride can display peak broadening and co-elution with other species if the compounds are not delivered to the GC column in a small volume of carrier gas. Refocusing of the sample after collection on the primary trap, either on a separate focusing trap or at the head of the gas chromatographic column, mitigates this problem.

6.2 Interferences in canister samples may result from improper use or from contamination of: (1) the canisters due to poor manufacturing practices, (2) the canister cleaning apparatus, and (3) the sampling or analytical system. Attention to the following details will help to minimize the possibility of contamination of canisters.

6.2.1 Canisters should be manufactured using high quality welding and cleaning techniques, and new canisters should be filled with humidified zero air and then analyzed, after "aging" for 24 hours, to determine cleanliness. The cleaning apparatus, sampling system, and analytical system should be assembled of clean, high quality components and each system should be shown to be free of contamination.

6.2.2 Canisters should be stored in a contaminant-free location and should be capped tightly during shipment to prevent leakage and minimize any compromise of the sample.

6.2.3 Impurities in the calibration dilution gas (if applicable) and carrier gas, organic compounds out-gassing from the system components ahead of the trap, and solvent vapors in the laboratory account for the majority of contamination problems. The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running humidified zero air blanks. The use of non-chromatographic grade stainless steel tubing, non-PTFE thread sealants, or flow controllers with Buna-N rubber components must be avoided.

6.2.4 Significant contamination of the analytical equipment can occur whenever samples containing high VOC concentrations are analyzed. This in turn can result in carryover contamination in subsequent analyses. Whenever a high concentration (>25 ppbv of a trace species) sample is encountered, it should be followed by an analysis of humid zero air to check for carry-over contamination.

6.2.5 In cases when solid sorbents are used to concentrate the sample prior to analysis, the sorbents should be tested to identify artifact formation (see Compendium Method TO-17 for more information on artifacts).

7. Apparatus and Reagents

[Note: Compendium Method To-14A list more specific requirements for sampling and analysis apparatus which may be of help in identifying options. The listings below are generic.]

7.1 Sampling Apparatus

[Note: Subatmospheric pressure and pressurized canister sampling systems are commercially available and have been used as part of U.S. Environmental Protection Agency's Toxic Air Monitoring Stations (TAMS), Urban Air Toxic Monitoring Program (UATMP), the non-methane organic compound (NMOC) sampling and analysis program, and the Photochemical Assessment Monitoring Stations (PAMS).]

7.1.1 Subatmospheric Pressure (see Figure 1, without metal bellows type pump).

7.1.1.1 Sampling Inlet Line. Stainless steel tubing to connect the sampler to the sample inlet.

7.1.1.2 Sample Canister. Leak-free stainless steel pressure vessels of desired volume (e.g., 6 L), with valve and specially prepared interior surfaces (see Appendix B for a listing of known manufacturers/resellers of canisters).

7.1.1.3 Stainless Steel Vacuum/Pressure Gauges. Two types are required, one capable of measuring vacuum (–100 to 0 kPa or 0 to - 30 in Hg) and pressure (0–206 kPa or 0–30 psig) in the sampling system and a second type (for checking the vacuum of canisters during cleaning) capable of measuring at 0.05 mm Hg (see Appendix B) within 20%. Gauges should be tested clean and leak tight.

7.1.1.4 Electronic Mass Flow Controller. Capable of maintaining a constant flow rate (± 10%) over a sampling period of up to 24 hours and under conditions of changing temperature (20–40°C) and humidity.

7.1.1.5 Particulate Matter Filter. 2-μm sintered stainless steel in-line filter.

7.1.1.6 Electronic Timer. For unattended sample collection.

7.1.1.7 Solenoid Valve. Electrically-operated, bi-stable solenoid valve with Viton® seat and O-rings. A Skinner Magnelatch valve is used for purposes of illustration in the text (see Figure 2).

7.1.1.8 Chromatographic Grade Stainless Steel Tubing and Fittings. For interconnections. All such materials in contact with sample, analyte, and support gases prior to analysis should be chromatographic grade stainless steel or equivalent.

7.1.1.9 Thermostatically Controlled Heater. To maintain above ambient temperature inside insulated sampler enclosure.

7.1.1.10 Heater Thermostat. Automatically regulates heater temperature.

7.1.1.11 Fan. For cooling sampling system.

7.1.1.12 Fan Thermostat. Automatically regulates fan operation.

7.1.1.13 Maximum-Minimum Thermometer. Records highest and lowest temperatures during sampling period.

7.1.1.14 Stainless Steel Shut-off Valve. Leak free, for vacuum/pressure gauge.

7.1.1.15 Auxiliary Vacuum Pump. Continuously draws air through the inlet manifold at 10 L/min. or higher flow rate. Sample is extracted from the manifold at a lower rate, and excess air is exhausted.

[Note: The use of higher inlet flow rates dilutes any contamination present in the inlet and reduces the possibility of sample contamination as a result of contact with active adsorption sites on inlet walls.]

7.1.1.16 Elapsed Time Meter. Measures duration of sampling.

7.1.1.17 Optional Fixed Orifice, Capillary, or Adjustable Micrometering Valve. May be used in lieu of the electronic flow controller for grab samples or short duration time-integrated samples. Usually appropriate only in situations where screening samples are taken to assess future sampling activity.

7.1.2 Pressurized (see Figure 1 with metal bellows type pump and Figure 3).

7.1.2.1 Sample Pump. Stainless steel, metal bellows type, capable of 2 atmospheres output pressure. Pump must be free of leaks, clean, and uncontaminated by oil or organic compounds.

[Note: An alternative sampling system has been developed by Dr. R. Rasmussen, The Oregon Graduate Institute of Science and Technology, 20000 N.W. Walker Rd., Beaverton, Oregon 97006, 503-690-1077, and is illustrated in Figure 3. This flow system uses, in order, a pump, a mechanical flow regulator, and a mechanical compensation flow restrictive device. In this configuration the pump is purged with a large sample flow, thereby eliminating the need for an auxiliary vacuum pump to flush the sample inlet.]

7.1.2.2 Other Supporting Materials. All other components of the pressurized sampling system are similar to components discussed in Sections 7.1.1.1 through 7.1.1.17.

7.2 Analytical Apparatus

7.2.1 Sampling/Concentrator System (many commercial alternatives are available).

7.2.1.1 Electronic Mass Flow Controllers. Used to maintain constant flow (for purge gas, carrier gas and sample gas) and to provide an analog output to monitor flow anomalies.

7.2.1.2 Vacuum Pump. General purpose laboratory pump, capable of reducing the downstream pressure of the flow controller to provide the pressure differential necessary to maintain controlled flow rates of sample air.

7.2.1.3 Stainless Steel Tubing and Stainless Steel Fittings. Coated with fused silica to minimize active adsorption sites.

7.2.1.4 Stainless Steel Cylinder Pressure Regulators. Standard, two-stage cylinder regulators with pressure gauges.

7.2.1.5 Gas Purifiers. Used to remove organic impurities and moisture from gas streams.

7.2.1.6 Six-port Gas Chromatographic Valve. For routing sample and carrier gas flows.

7.2.1.7 Multisorbent Concentrator. Solid adsorbent packing with various retentive properties for adsorbing trace gases are commercially available from several sources. The packing contains more than one type of adsorbent packed in series.

7.2.1.7.1A pre-packed adsorbent trap (Supelco 2-0321) containing 200 mg Carbopack B (60/80 mesh) and 50 mg Carbosieve S-III (60/80 mesh) has been found to retain VOCs and allow some water vapor to pass through (6). The addition of a dry purging step allows for further water removal from the adsorbent trap. The steps constituting the dry purge technique that are normally used with multisorbent traps are illustrated in Figure 4. The optimum trapping and dry purging procedure for the Supelco trap consists of a sample volume of 320 mL and a dry nitrogen purge of 1300 mL. Sample trapping and drying is carried out at 25°C. The trap is back-flushed with helium and heated to 220°C to transfer material onto the GC column. A trap bake-out at 260°C for 5 minutes is conducted after each run.

7.2.1.7.2 An example of the effectiveness of dry purging is shown in Figure 5. The multisorbent used in this case is Tenax/Ambersorb 340/Charcoal (7). Approximately 20% of the initial water content in the sample remains after sampling 500 mL of air. The detector response to water vapor (hydrogen atoms detected by atomic emission detection) is plotted versus purge gas volume. Additional water reduction by a factor of 8 is indicated at temperatures of 45°C or higher. Still further water reduction is possible using a two-stage concentration/dryer system.

7.2.1.8 Cryogenic Concentrator. Complete units are commercially available from several vendor sources. The characteristics of the latest concentrators include a rapid, "ballistic" heating of the concentrator to release any trapped VOCs into a small carrier gas volume. This facilitates the separation of compounds on the gas chromatographic column.

7.2.2 Gas Chromatographic/Mass Spectrometric (GC/MS) System.

7.2.2.1 Gas Chromatograph. The gas chromatographic (GC) system must be capable of temperature programming. The column oven can be cooled to subambient temperature (e.g., -50°C) at the start of the gas chromatographic run to effect a resolution of the very volatile organic compounds. In other designs, the rate of release of compounds from the focusing trap in a two stage system obviates the need for retrapping of compounds on the column. The system must include or be interfaced to a concentrator and have all required accessories including analytical columns and gases. All GC carrier gas lines must be constructed from stainless steel or copper tubing. Non-polytetrafluoroethylene (PTFE) thread sealants or flow controllers with Buna-N rubber components must not be used.

7.2.2.2 Chromatographic Columns. 100% methyl silicone or 5% phenyl, 95% methyl silicone fused silica capillary columns of 0.25- to 0.53-mm I.D. of varying lengths are recommended for separation of many of the possible subsets of target compounds involving nonpolar compounds. However, considering the diversity of the target list, the choice is left to the operator subject to the performance standards given in Section 11.

7.2.2.3 Mass Spectrometer. Either a linear quadrupole or ion trap mass spectrometer can be used as long as it is capable of scanning from 35 to 300 amu every 1 second or less, utilizing 70 volts (nominal) electron energy in the electron impact ionization mode, and producing a mass spectrum which meets all the instrument performance acceptance criteria when 50 ng or less of p-bromofluorobenzene (BFB) is analyzed.

7.2.2.3.1Linear Quadrupole Technology. A simplified diagram of the heart of the quadrupole mass spectrometer is shown in Figure 6. The quadrupole consists of a parallel set of four rod electrodes mounted in a square configuration. The field within the analyzer is created by coupling opposite pairs of rods together and applying radiofrequency (RF) and direct current (DC) potentials between the pairs of rods. Ions created in the ion source from the reaction of column eluates with electrons from the electron source are moved through the

parallel array of rods under the influence of the generated field. Ions which are successfully transmitted through the quadrupole are said to possess stable trajectories and are subsequently recorded with the detection system. When the DC potential is zero, a wide band of m/z values is transmitted through the quadrupole. This "RF only" mode is referred to as the "total-ion" mode. In this mode, the quadrupole acts as a strong focusing lens analogous to a high pass filter. The amplitude of the RF determines the low mass cutoff. A mass spectrum is generated by scanning the DC and RF voltages using a fixed DC/RF ratio and a constant drive frequency or by scanning the frequency and holding the DC and RF constant. With the quadrupole system only 0.1 to 0.2 percent of the ions formed in the ion source actually reach the detector.

7.2.2.3.2Ion Trap Technology. An ion-trap mass spectrometer consists of a chamber formed between two metal surfaces in the shape of a hyperboloid of one sheet (ring electrode) and a hyperboloid of two sheets (the two end-cap electrodes). Ions are created within the chamber by electron impact from an electron beam admitted through a small aperture in one of the end caps. Radio frequency (RF) (and sometimes direct current voltage offsets) are applied between the ring electrode and the two end-cap electrodes establishing a quadrupole electric field. This field is uncoupled in three directions so that ion motion can be considered independently in each direction; the force acting upon an ion increases with the displacement of the ion from the center of the field but the direction of the force depends on the instantaneous voltage applied to the ring electrode. A restoring force along one coordinate (such as the distance, r, from the ion-trap's axis of radial symmetry) will exist concurrently with a repelling force along another coordinate (such as the distance, z, along the ion traps axis), and if the field were static the ions would eventually strike an electrode. However, in an RF field the force along each coordinate alternates direction so that a stable trajectory may be possible in which the ions do not strike a surface. In practice, ions of appropriate mass-to-charge ratios may be trapped within the device for periods of milliseconds to hours. A diagram of a typical ion trap is illustrated in Figure 7. Analysis of stored ions is performed by increasing the RF voltage, which makes the ions successively unstable. The effect of the RF voltage on the ring electrode is to "squeeze" the ions in the xy plane so that they move along the z axis. Half the ions are lost to the top cap (held at ground potential); the remaining ions exit the lower end cap to be detected by the electron multiplier. As the energy applied to the ring electrode is increased, the ions are collected in order of increasing mass to produce a conventional mass spectrum. With the ion trap, approximately 50 percent of the generated ions are detected. As a result, a significant increase in sensitivity can be achieved when compared to a full scan linear quadrupole system.

7.2.2.4 GC/MS Interface. Any gas chromatograph to mass spectrometer interface that gives acceptable calibration points for each of the analytes of interest and can be used to achieve all acceptable performance criteria may be used. Gas chromatograph to mass spectrometer interfaces constructed of all-glass, glass-lined, or fused silica-lined materials are recommended. Glass and fused silica should be deactivated.

7.2.2.5 Data System. The computer system that is interfaced to the mass spectrometer must allow the continuous acquisition and storage, on machine readable media, of all mass spectra obtained throughout the duration of the chromatographic program. The computer must have software that allows searching any GC/MS data file for ions of a specified mass and plotting such ion abundances versus time or scan number. This type of plot is defined as a Selected Ion Current Profile (SICP). Software must also be available that allows integrating the abundance in any SICP between specified time or scan number limits. Also, software must be available that allows for the comparison of sample spectra with reference library spectra. The National Institute of Standards and Technology (NIST) or Wiley Libraries or equivalent are recommended as reference libraries.

7.2.2.6 Off-line Data Storage Device. Device must be capable of rapid recording and retrieval of data and must be suitable for long-term, off-line data storage.

7.3 Calibration System and Manifold Apparatus (see Figure 8)

7.3.1 Calibration Manifold. Stainless steel, glass, or high purity quartz manifold, (e.g.,1.25-cm I.D. x 66-cm) with sampling ports and internal baffles for flow disturbance to ensure proper mixing. The manifold should be heated to ~50°C.

7.3.2 Humidifier. 500-mL impinger flask containing HPLC grade deionized water.

7.3.3 Electronic Mass Flow Controllers. One 0 to 5 L/min unit and one or more 0 to 100 mL/min units for air, depending on number of cylinders in use for calibration.

7.3.4 Teflon Filter(s). 47-mm Teflon® filter for particulate collection.

7.4 Reagents

7.4.1 Neat Materials or Manufacturer-Certified Solutions/Mixtures. Best source (see Section 9).

7.4.2 Helium and Air. Ultra-high purity grade in gas cylinders. He is used as carrier gas in the GC.

7.4.3 Liquid Nitrogen or Liquid Carbon Dioxide. Used to cool secondary trap.

7.4.4 Deionized Water. High performance liquid chromatography (HPLC) grade, ultra-high purity (for humidifier).

8. Collection of Samples in Canisters

8.1 Introduction

8.1.1 Canister samplers, sampling procedures, and canister cleaning procedures have not changed very much from the description given in the original Compendium Method TO-14. Much of the material in this section is therefore simply a restatement of the material given in Compendium Method TO-14, repeated here in order to have all the relevant information in one place.

8.1.2 Recent notable additions to the canister technology has been in the application of canister-based systems for example, to microenvironmental monitoring (8), the capture of breath samples (9), and sector sampling to identify emission sources of VOCs (10).

8.1.3 EPA has also sponsored the development of a mathematical model to predict the storage stability of arbitrary mixtures of trace gases in humidified air (3), and the investigation of the SilcoSteel™ process of coating the canister interior with a film of fused silica to reduce surface activity (11). A recent summary of storage stability data for VOCs in canisters is given in the open literature (5).

8.2 Sampling System Description

8.2.1 Subatmospheric Pressure Sampling [see Figure 1 (without metal bellows type pump)].

8.2.1.1 In preparation for subatmospheric sample collection in a canister, the canister is evacuated to 0.05 mm Hg (see Appendix C for discussion of evacuation pressure). When the canister is opened to the atmosphere containing the VOCs to be sampled, the differential pressure causes the sample to flow into the canister. This technique may be used to collect grab samples (duration of 10 to 30 seconds) or time-weighted-average (TWA) samples (duration of 1-24 hours) taken through a flow-restrictive inlet (e.g., mass flow controller, critical orifice).

8.2.1.2 With a critical orifice flow restrictor, there will be a decrease in the flow rate as the pressure approaches atmospheric. However, with a mass flow controller, the subatmospheric sampling system can maintain a constant flow rate from full vacuum to within about 7 kPa (1.0 psi) or less below ambient pressure.

8.2.2 Pressurized Sampling [see Figure 1 (with metal bellows type pump)].

8.2.2.1 Pressurized sampling is used when longer-term integrated samples or higher volume samples are required. The sample is collected in a canister using a pump and flow control arrangement to achieve a typical 101-202 kPa (15-30 psig) final canister pressure. For example, a 6-liter evacuated canister can be filled at 10 mL/min for 24 hours to achieve a final pressure of 144 kPa (21 psig).

8.2.2.2 In pressurized canister sampling, a metal bellows type pump draws in air from the sampling manifold to fill and pressurize the sample canister.

8.2.3 All Samplers.

8.2.3.1 A flow control device is chosen to maintain a constant flow into the canister over the desired sample period. This flow rate is determined so the canister is filled (to about 88.1 kPa for subatmospheric pressure sampling or to about one atmosphere above ambient pressure for pressurized sampling) over the desired sample period. The flow rate can be calculated by:

$$F = \frac{P \times V}{T \times 60}$$

where:

F = flow rate, mL/min.
P = final canister pressure, atmospheres absolute. P is approximately equal to

$$\frac{\text{kPa gauge}}{101.2} + 1$$

V = volume of the canister, mL.
T = sample period, hours.

For example, if a 6-L canister is to be filled to 202 kPa (2 atmospheres) absolute pressure in 24 hours, the flow rate can be calculated by:

$$F = \frac{2 \times 6000}{24 \times 60} = 8.3 \text{ mL/min}$$

8.2.3.2 For automatic operation, the timer is designed to start and stop the pump at appropriate times for the desired sample period. The timer must also control the solenoid valve, to open the valve when starting the pump and to close the valve when stopping the pump.

8.2.3.3 The use of the Skinner Magnelatch valve (see Figure 2) avoids any substantial temperature rise that would occur with a conventional, normally closed solenoid valve that would have to be energized during the entire sample period. The temperature rise in the valve could cause outgassing of organic compounds from the Viton® valve seat material. The Skinner Magnelatch valve requires only a brief electrical pulse to open or close at the appropriate start and stop times and therefore experiences no temperature increase. The pulses may be obtained either with an electronic timer that can be programmed for short (5 to 60 seconds) ON periods, or with a conventional mechanical timer and a special pulse circuit. A simple electrical pulse circuit for operating the Skinner Magnelatch solenoid valve with a conventional mechanical timer is illustrated in Figure 2(a). However, with this simple circuit, the valve may operate unreliably during brief power interruptions or if the timer is manually switched on and off too fast. A better circuit incorporating a time-delay relay to provide more reliable valve operation is shown in Figure 2(b).

8.2.3.4 The connecting lines between the sample inlet and the canister should be as short as possible to minimize their volume. The flow rate into the canister should remain relatively constant over the entire sampling period.

8.2.3.5 As an option, a second electronic timer may be used to start the auxiliary pump several hours prior to the sampling period to flush and condition the inlet line.

8.2.3.6 Prior to field use, each sampling system must pass a humid zero air certification (see Section 8.4.3). All plumbing should be checked carefully for leaks. The canisters must also pass a humid zero air certification before use (see Section 8.4.1).

8.3 Sampling Procedure

8.3.1 The sample canister should be cleaned and tested according to the procedure in Section 8.4.1.

8.3.2 A sample collection system is assembled as shown in Figures 1 and 3 and must be cleaned according to the procedure outlined in Sections 8.4.2 and 8.4.4.

[Note: The sampling system should be contained in an appropriate enclosure.]

8.3.3 Prior to locating the sampling system, the user may want to perform "screening analyses" using a portable GC system, as outlined in Appendix B of Compendium Method TO-14A, to determine potential volatile organics present and potential "hot spots." The information gathered from the portable GC screening analysis would be used in developing a monitoring protocol, which includes the sampling system location, based upon the "screening analysis" results.

8.3.4 After "screening analysis," the sampling system is located. Temperatures of ambient air and sampler box interior are recorded on the canister sampling field test data sheet (FTDS), as documented in Figure 9.

[Note: The following discussion is related to Figure 1]

8.3.5 To verify correct sample flow, a "practice" (evacuated) canister is used in the sampling system.

[Note: For a subatmospheric sampler, a flow meter and practice canister are needed. For the pump-driven system, the practice canister is not needed, as the flow can be measured at the outlet of the system.]

A certified mass flow meter is attached to the inlet line of the manifold, just in front of the filter. The canister is opened. The sampler is turned on and the reading of the certified mass flow meter is compared to the sampler mass flow controller. The values should agree within ±10%. If not, the sampler mass flow meter needs to be recalibrated or there is a leak in the system. This should be investigated and corrected.

[Note: Mass flow meter readings may drift. Check the zero reading carefully and add or subtract the zero reading when reading or adjusting the sampler flow rate to compensate for any zero drift.]

After 2 minutes, the desired canister flow rate is adjusted to the proper value (as indicated by the certified mass flow meter) by the sampler flow control unit controller (e.g., 3.5 mL/min for 24 hr, 7.0 mL/min for 12 hr). Record final flow under "CANISTER FLOW RATE" on the FTDS.

8.3.6 The sampler is turned off and the elapsed time meter is reset to 000.0.

[Note: Whenever the sampler is turned off, wait at least 30 seconds to turn the sampler back on.]

8.3.7 The "practice" canister and certified mass flow meter are disconnected and a clean certified (see Section 8.4.1) canister is attached to the system.

8.3.8 The canister valve and vacuum/pressure gauge valve are opened.

8.3.9 Pressure/vacuum in the canister is recorded on the canister FTDS (see Figure 9) as indicated by the sampler vacuum/pressure gauge.

8.3.10 The vacuum/pressure gauge valve is closed and the maximum-minimum thermometer is reset to current temperature. Time of day and elapsed time meter readings are recorded on the canister FTDS.

8.3.11 The electronic timer is set to start and stop the sampling period at the appropriate times. Sampling starts and stops by the programmed electronic timer.

8.3.12 After the desired sampling period, the maximum, minimum, current interior temperature and current ambient temperature are recorded on the FTDS. The current reading from the flow controller is recorded.

8.3.13 At the end of the sampling period, the vacuum/pressure gauge valve on the sampler is briefly opened and closed and the pressure/vacuum is recorded on the FTDS. Pressure should be close to desired pressure.

[Note: For a subatmospheric sampling system, if the canister is at atmospheric pressure when the field final pressure check is performed, the sampling period may be suspect. This information should be noted on the sampling field data sheet.]

Time of day and elapsed time meter readings are also recorded.

8.3.14 The canister valve is closed. The sampling line is disconnected from the canister and the canister is removed from the system. For a subatmospheric system, a certified mass flow meter is once again connected to the inlet manifold in front of the in-line filter and a "practice" canister is attached to the Magnelatch valve of the sampling system. The final flow rate is recorded on the canister FTDS (see Figure 9).

[Note: For a pressurized system, the final flow may be measured directly.]

The sampler is turned off.

8.3.15 An identification tag is attached to the canister. Canister serial number, sample number, location, and date, as a minimum, are recorded on the tag. The canister is routinely transported back to the analytical laboratory with other canisters in a canister shipping case.

8.4 Cleaning and Certification Program

8.4.1 Canister Cleaning and Certification.

8.4.1.1 All canisters must be clean and free of any contaminants before sample collection.

8.4.1.2 All canisters are leak tested by pressurizing them to approximately 206 kPa (30 psig) with zero air.

[Note: The canister cleaning system in Figure 10 can be used for this task.]

The initial pressure is measured, the canister valve is closed, and the final pressure is checked after 24 hours. If acceptable, the pressure should not vary more than ± 13.8 kPa (± 2 psig) over the 24 hour period.

8.4.1.3 A canister cleaning system may be assembled as illustrated in Figure 10. Cryogen is added to both the vacuum pump and zero air supply traps. The canister(s) are connected to the manifold. The vent shut-off valve and the canister valve(s) are opened to release any remaining pressure in the canister(s). The vacuum pump is started and the vent shut-off valve is then closed and the vacuum shut-off valve is opened. The canister(s) are evacuated to <0.05 mm Hg (see Appendix B) for at least 1 hour.

[Note: On a daily basis or more often if necessary, the cryogenic traps should be purged with zero air to remove any trapped water from previous canister cleaning cycles.]

Air released/evacuated from canisters should be diverted to a fume hood.

8.4.1.4 The vacuum and vacuum/pressure gauge shut-off valves are closed and the zero air shut-off valve is opened to pressurize the canister(s) with humid zero air to approximately 206 kPa (30 psig). If a zero gas generator system is used, the flow rate may need to be limited to maintain the zero air quality.

8.4.1.5 The zero air shut-off valve is closed and the canister(s) is allowed to vent down to atmospheric pressure through the vent shut-off valve. The vent shut-off valve is closed. Repeat Sections 8.4.1.3 through 8.4.1.5 two additional times for a total of three (3) evacuation/pressurization cycles for each set of canisters.

8.4.1.6 At the end of the evacuation/pressurization cycle, the canister is pressurized to 206 kPa (30 psig) with humid zero air. The canister is then analyzed by a GC/MS analytical system. Any canister that has not tested clean (compared to direct analysis of humidified zero air of less than 0.2 ppbv of targeted VOCs) should not be used. As a "blank" check of the canister(s) and cleanup procedure, the final humid zero air fill of 100% of the canisters is analyzed until the cleanup system and canisters are proven reliable (less than 0.2 ppbv of any target VOCs). The check can then be reduced to a lower percentage of canisters.

8.4.1.7 The canister is reattached to the cleaning manifold and is then reevacuated to <0.05 mm Hg (see Appendix B) and remains in this condition until used. The canister valve is closed. The canister is removed from the cleaning system and the canister connection is capped with a stainless steel fitting. The canister is now ready for collection of an air sample. An identification tag is attached to the inlet of each canister for field notes and chain-of-custody purposes. An alternative to evacuating the canister at this point is to store the canisters and reevacuate them just prior to the next use.

8.4.1.8 As an option to the humid zero air cleaning procedures, the canisters are heated in an isothermal oven not to exceed 100°C during evacuation of the canister to ensure that higher molecular weight compounds are not retained on the walls of the canister.

[Note: For sampling more complex VOC mixtures the canisters should be heated to higher temperatures during the cleaning procedure although a special high temperature valve would be needed].

Once heated, the canisters are evacuated to <0.05 mm Hg (see Appendix B) and maintained there for 1 hour. At the end of the heated/evacuated cycle, the canisters are pressurized with humid zero air and analyzed by a GC/MS system after a minimum of 12 hrs of "aging." Any canister that has not tested clean (less than 0.2 ppbv each of targeted compounds) should not be used. Once tested clean, the canisters are reevacuated to <0.05 mm Hg (see Appendix B) and remain in the evacuated state until used. As noted in Section 8.4.1.7, reevacuation can occur just prior to the next use.

8.4.2 Cleaning Sampling System Components.

8.4.2.1 Sample components are disassembled and cleaned before the sampler is assembled. Nonmetallic parts are rinsed with HPLC grade deionized water and dried in a vacuum oven at 50°C. Typically, stainless steel parts and fittings are cleaned by placing them in a beaker of methanol in an ultrasonic bath for 15 minutes. This procedure is repeated with hexane as the solvent.

8.4.2.2 The parts are then rinsed with HPLC grade deionized water and dried in a vacuum oven at 100°C for 12 to 24 hours.

8.4.2.3 Once the sampler is assembled, the entire system is purged with humid zero air for 24 hours.

8.4.3 Zero Air Certification.

[Note: In the following sections, "certification" is defined as evaluating the sampling system with humid zero air and humid calibration gases that pass through all active components of the sampling system. The system is "certified" if no significant additions or deletions (less than 0.2 ppbv each of target compounds) have occurred when challenged with the test gas stream.]

8.4.3.1 The cleanliness of the sampling system is determined by testing the sampler with humid zero air without an evacuated gas sampling canister, as follows.

8.4.3.2 The calibration system and manifold are assembled, as illustrated in Figure 8. The sampler (without an evacuated gas canister) is connected to the manifold and the zero air cylinder is activated to generate a humid gas stream (2 L/min) to the calibration manifold [see Figure 8(b)].

8.4.3.3 The humid zero gas stream passes through the calibration manifold, through the sampling system (without an evacuated canister) to the water management system/VOC preconcentrator of an analytical system.

[Note: The exit of the sampling system (without the canister) replaces the canister in Figure 11.]

After the sample volume (e.g., 500 mL) is preconcentrated on the trap, the trap is heated and the VOCs are thermally desorbed and refocussed on a cold trap. This trap is heated and the VOCs are thermally desorbed onto the head of the capillary column. The VOCs are refocussed prior to gas chromatographic separation. Then, the oven temperature (programmed) increases and the VOCs begin to elute and are detected by a GC/MS (see Section 10) system. The analytical system should not detect greater than 0.2 ppbv of any targeted VOCs in order for the sampling system to pass the humid zero air certification test. Chromatograms (using an FID) of a certified sampler and contaminated sampler are illustrated in Figures 12(a) and 12(b), respectively. If the sampler passes the humid zero air test, it is then tested with humid calibration gas standards containing selected VOCs at concentration levels expected in field sampling (e.g., 0.5 to 2 ppbv) as outlined in Section 8.4.4.

8.4.4 Sampler System Certification with Humid Calibration Gas Standards from a Dynamic Calibration System

8.4.4.1 Assemble the dynamic calibration system and manifold as illustrated in Figure 8.

8.4.4.2 Verify that the calibration system is clean (less than 0.2 ppbv of any target compounds) by sampling a humidified gas stream, *without* gas calibration standards, with a previously certified clean canister (see Section 8.1).

8.4.4.3 The assembled dynamic calibration system is certified clean if less than 0.2 ppbv of any targeted compounds is found.

8.4.4.4 For generating the humidified calibration standards, the calibration gas cylinder(s) containing nominal concentrations of 10 ppmv in nitrogen of selected VOCs is attached to the calibration system as illustrated in Figure 8. The gas cylinders are opened and the gas mixtures are passed through 0 to 10 mL/min certified mass flow controllers to generate ppb levels of calibration standards.

8.4.4.5 After the appropriate equilibrium period, attach the sampling system (containing a certified evacuated canister) to the manifold, as illustrated in Figure 8(b).

8.4.4.6 Sample the dynamic calibration gas stream with the sampling system.

8.4.4.7 Concurrent with the sampling system operation, realtime monitoring of the calibration gas stream is accomplished by the on-line GC/MS analytical system [Figure 8(a)] to provide reference concentrations of generated VOCs.

8.4.4.8 At the end of the sampling period (normally the same time period used for experiments), the sampling system canister is analyzed and compared to the reference GC/MS analytical system to determine if the concentration of the targeted VOCs was increased or decreased by the sampling system.

8.4.4.9 A recovery of between 90% and 110% is expected for all targeted VOCs.

8.4.5 Sampler System Certification without Compressed Gas Cylinder Standards.

8.4.5.1 Not all the gases on the Title III list are available/compatible with compressed gas standards. In these cases sampler certification must be approached by different means.

8.4.5.2 Definitive guidance is not currently available in these cases; however, Section 9.2 lists several ways to generate gas standards. In general, Compendium Method TO-14A compounds (see Table 1) are available commercially as compressed gas standards.

9. GC/MS Analysis of Volatiles from Canisters

9.1 Introduction

9.1.1 The analysis of canister samples is accomplished with a GC/MS system. Fused silica capillary columns are used to achieve high temporal resolution of target compounds. Linear quadrupole or ion trap mass spectrometers are employed for compound detection. The heart of the system is composed of the sample inlet concentrating device that is needed to increase sample loading into a detectable range. Two examples of concentrating systems are discussed. Other approaches are acceptable as long as they are compatible with achieving the system performance criteria given in Section 11.

9.1.2 With the first technique, a whole air sample from the canister is passed through a multisorbent packing (including single adsorbent packings) contained within a metal or glass tube maintained at or above the surrounding air temperature. Depending on the water retention properties of the packing, some or most of the water vapor passes completely through the trap during sampling. Additional drying of the sample is accomplished after the sample concentration is completed by forward purging the trap with clean, dry helium or another inert gas (air is not used). The sample is then thermally desorbed from the packing and backflushed from the trap onto a gas chromatographic column. In some systems a "refocusing" trap is placed between the primary trap and the gas chromatographic column. The specific system design downstream of the primary trap depends on technical factors such as the rate of thermal desorption and sampled volume, but the objective in most cases is to enhance chromatographic resolution of the individual sample components before detection on a mass spectrometer.

9.1.3 Sample drying strategies depend on the target list of compounds. For some target compound lists, the multisorbent packing of the concentrator can be selected from hydrophobic adsorbents which allow a high percentage of water vapor in the sample to pass through the concentrator during sampling and without significant loss of the target compounds. However, if very volatile organic compounds are on the target list, the adsorbents required for their retention may also strongly retain water vapor and a more lengthy dry purge is necessary prior to analysis.

9.1.4 With the second technique, a whole air sample is passed through a concentrator where the VOCs are condensed on a reduced temperature surface (cold trap). Subsequently, the condensed gases are thermally desorbed and backflushed from the trap with an inert gas onto a gas chromatographic column. This concentration technique is similar to that discussed in Compendium Method TO-14, although a membrane dryer is not used. The sample size is reduced in volume to limit the amount of water vapor that is also collected (100 mL or less may be necessary). The attendant reduction in sensitivity is offset by enhancing the sensitivity of detection, for example by using an ion trap detector.

9.2 Preparation of Standards

9.2.1 Introduction.

9.2.1.1 When available, standard mixtures of target gases in high pressure cylinders must be certified traceable to a NIST Standard Reference Material (SRM) or to a NIST/EPA approved Certified Reference Material (CRM). Manufacturer's certificates of analysis must be retained to track the expiration date.

9.2.1.2 The neat standards that are used for making trace gas standards must be of high purity; generally a purity of 98 percent or better is commercially available.

9.2.1.3 Cylinder(s) containing approximately 10 ppmv of each of the target compounds are typically used as primary stock standards. The components may be purchased in one cylinder or in separate cylinders depending on compatibility of the compounds and the pressure of the mixture in the cylinder. Refer to manufacturer's specifications for guidance on purchasing and mixing VOCs in gas cylinders.

9.2.2 Preparing Working Standards.

9.2.2.1 Instrument Performance Check Standard. Prepare a standard solution of BFB in humidified zero air at a concentration which will allow collection of 50 ng of BFB or less under the optimized concentration parameters.

9.2.2.2 Calibration Standards. Prepare five working calibration standards in humidified zero air at a concentration which will allow collection at the 2, 5, 10, 20, and 50 ppbv level for each component under the optimized concentration parameters.

9.2.2.3 Internal Standard Spiking Mixture. Prepare an internal spiking mixture containing bromochloromethane, chlorobenzene-d_5, and 1,4-difluorobenzene at 10 ppmv each in humidified zero air to be added to the sample or calibration standard. 500 µL of this mixture spiked into 500 mL of sample will result in a concentration of 10 ppbv. The internal standard is introduced into the trap during the collection time for all calibration, blank, and sample analyses using the apparatus shown in Figure 13 or by equivalent means. The volume of internal standard spiking mixture added for each analysis must be the same from run to run.

9.2.3 Standard Preparation by Dynamic Dilution Technique.

9.2.3.1 Standards may be prepared by dynamic dilution of the gaseous contents of a cylinder(s) containing the gas calibration stock standards with humidified zero air using mass flow controllers and a calibration manifold. The working standard may be delivered from the manifold to a clean, evacuated canister using a pump and mass flow controller.

9.2.3.2 Alternatively, the analytical system may be calibrated by sampling directly from the manifold if the flow rates are optimized to provide the desired amount of calibration standards. However, the use of the canister as a reservoir prior to introduction into the concentration system resembles the procedure normally used to collect samples and is preferred. Flow rates of the dilution air and cylinder standards (all expressed in the same units) are measured using a bubble meter or calibrated electronic flow measuring device, and the concentrations of target compounds in the manifold are then calculated using the dilution ratio and the original concentration of each compound.

$$\text{Manifold Conc.} = \frac{(\text{Original Conc.})\ (\text{Std. Gas Flowrate})}{(\text{Air Flowrate}) + (\text{Std. Gas Flowrate})}$$

9.2.3.3 Consider the example of 1 mL/min flow of 10 ppmv standard diluted with 1,000 mL/min of humid air provides a nominal 10 ppbv mixture, as calculated below:

$$\text{Manifold Conc.} = \frac{(10\ \text{ppm})(1\ \text{mL/min})(1000\ \text{ppb/1 ppm})}{(1000\ \text{mL/min}) + (1\ \text{mL/min})} = 10\ \text{ppb}$$

9.2.4 Standard Preparation by Static Dilution Bottle Technique

[Note: Standards may be prepared in canisters by spiking the canister with a mixture of components prepared in a static dilution bottle (12). This technique is used specifically for liquid standards.]

9.2.4.1 The volume of a clean 2-liter round-bottom flask, modified with a threaded glass neck to accept a Mininert septum cap, is determined by weighing the amount of water required to completely fill up the flask. Assuming a density for the water of 1 g/mL, the weight of the water in grams is taken as the volume of the flask in milliliters.

9.2.4.2 The flask is flushed with helium by attaching a tubing into the glass neck to deliver the helium. After a few minutes, the tubing is removed and the glass neck is immediately closed with a Mininert septum cap.

9.2.4.3 The flask is placed in a 60°C oven and allowed to equilibrate at that temperature for about 15 minutes. Predetermined aliquots of liquid standards are injected into the flask making sure to keep the flask temperature constant at 60°C.

9.2.4.4 The contents are allowed to equilibrate in the oven for at least 30 minutes. To avoid condensation, syringes must be preheated in the oven at the same temperature prior to withdrawal of aliquots to avoid condensation.

9.2.4.5 Sample aliquots may then be taken for introduction into the analytical system or for further dilution. An aliquot or aliquots totaling greater than 1 percent of the flask volume should be avoided.

9.2.4.6 Standards prepared by this method are stable for one week. The septum must be replaced with each freshly prepared standard.

9.2.4.7 The concentration of each component in the flask is calculated using the following equation:

$$\text{Concentration, mg/L} = \frac{(V_a)(d)}{V_f}$$

where: V_a = Volume of liquid neat standard injected into the flask, µL.
d = Density of the liquid neat standard, mg/µL.
V_f = Volume of the flask, L.

9.2.4.8 To obtain concentrations in ppbv, the equation given in Section 9.2.5.7 can be used.

[Note: In the preparation of standards by this technique, the analyst should make sure that the volume of neat standard injected into the flask does not result in an overpressure due to the higher partial pressure produced by the standard compared to the vapor pressure in the flask. Precautions should also be taken to avoid a significant decrease in pressure inside the flask after withdrawal of aliquot(s).]

9.2.5 Standard Preparation Procedure in High Pressure Cylinders

[Note: Standards may be prepared in high pressure cylinders (13). A modified summary of the procedure is provided below.]

9.2.5.1 The standard compounds are obtained as gases or neat liquids (greater than 98 percent purity).

9.2.5.2 An aluminum cylinder is flushed with high-purity nitrogen gas and then evacuated to better than 25 in. Hg.

9.2.5.3 Predetermined amounts of each neat standard compound are measured using a microliter or gastight syringe and injected into the cylinder. The cylinder is equipped with a heated injection port and nitrogen flow to facilitate sample transfer.

9.2.5.4 The cylinder is pressurized to 1000 psig with zero nitrogen.

[Note: User should read all SOPs associated with generating standards in high pressure cylinders. Follow all safety requirements to minimize danger from high pressure cylinders.]

9.2.5.5 The contents of the cylinder are allowed to equilibrate (~24 hrs) prior to withdrawal of aliquots into the GC system.

9.2.5.6 If the neat standard is a gas, the cylinder concentration is determined using the following equation:

$$\text{Concentration, ppbv} = \frac{\text{Volume}_{\text{standard}}}{\text{Volume}_{\text{dilution gas}}} \times 10^9$$

[Note: Both values must be expressed in the same units.]

9.2.5.7 If the neat standard is a liquid, the gaseous concentration can be determined using the following equations:

$$V = \frac{nRT}{P}$$

and:

$$n = \frac{(mL)(d)}{MW}$$

where:

V = Gaseous volume of injected compound at EPA standard temperature (25°C) and pressure (760 mm Hg), L.
n = Moles.
R = Gas constant, 0.08206 L-atm/mole °K.
T = 298°K (standard temperature).
P = 1 standard pressure, 760 mm Hg (1 atm).
mL = Volume of liquid injected, mL.
d = Density of the neat standard, g/mL.
MW = Molecular weight of the neat standard expressed, g/g-mole.

The gaseous volume of the injected compound is divided by the cylinder volume at STP and then multiplied by 10^9 to obtain the component concentration in ppb units.

9.2.6 Standard Preparation by Water Methods.

[Note: Standards may be prepared by a water purge and trap method (14) and summarized as follows].

9.2.6.1 A previously cleaned and evacuated canister is pressurized to 760 mm Hg absolute (1 atm) with zero grade air.

9.2.6.2 The air gauge is removed from the canister and the sparging vessel is connected to the canister with the short length of 1/16 in. stainless steel tubing.

[Note: Extra effort should be made to minimize possible areas of dead volume to maximize transfer of analytes from the water to the canister.]

9.2.6.3 A measured amount of the stock standard solution and the internal standard solution is spiked into 5 mL of water.

9.2.6.4 This water is transferred into the sparge vessel and purged with nitrogen for 10 mins at 100 mL/min. The sparging vessel is maintained at 40°C.

9.2.6.5 At the end of 10 mins, the sparge vessel is removed and the air gauge is re-installed, to further pressurize the canister with pure nitrogen to 1500 mm Hg absolute pressure (approximately 29 psia).

9.2.6.6 The canister is allowed to equilibrate overnight before use.

9.2.6.7 A schematic of this approach is shown in Figure 14.

9.2.7 Preparation of Standards by Permeation Tubes.

9.2.7.1 Permeation tubes can be used to provide standard concentration of a trace gas or gases. The permeation of the gas can occur from inside a permeation tube containing the trace species of interest to an air stream outside. Permeation can also occur from outside a permeable membrane tube to an air stream passing through the tube (e.g., a tube of permeable material immersed in a liquid).

9.2.7.2 The permeation system is usually held at a constant temperature to generate a constant concentration of trace gas. Commercial suppliers provide systems for generation and dilution of over 250 compounds. Some commercial suppliers of permeation tube equipment are listed in Appendix D.

9.2.8 Storage of Standards.

9.2.8.1 Working standards prepared in canisters may be stored for thirty days in an atmosphere free of potential contaminants.

9.2.8.2 It is imperative that a storage logbook be kept to document storage time.

10. GC/MS Operating Conditions

10.1 Preconcentrator

The following are typical cryogenic and adsorbent preconcentrator analytical conditions which, however, depend on the specific combination of solid sorbent and must be selected carefully by the operator. The reader is referred to Tables 1 and 2 of Compendium Method TO-17 for guidance on selection of sorbents. An example of a system using a solid adsorbent preconcentrator with a cryofocusing trap is discussed in the literature (15). Oven temperature programming starts above ambient.

10.1.1 Sample Collection Conditions

Cryogenic Trap	Adsorbent Trap

Set point	-150°C	Set point	27°C
Sample volume	- up to 100 mL	Sample volume	- up to 1,000 mL
Carrier gas purge flow	- none	Carrier gas purge flow	- selectable

[Note: The analyst should optimize the flow rate, duration of sampling, and absolute sample volume to be used. Other preconcentration systems may be used provided performance standards (see Section 11) are realized.]

10.1.2 Desorption Conditions

Cryogenic Trap		Adsorbent Trap	
Desorb Temperature	120°C	Desorb Temperature	Variable
Desorb Flow Rate	~ 3 mL/min He	Desorb Flow Rate	~3 mL/min He
Desorb Time	<60 sec	Desorb Time	<60 sec

The adsorbent trap conditions depend on the specific solid adsorbents chosen (see manufacturers' specifications).

10.1.3 Trap Reconditioning Conditions.

Cryogenic Trap		Adsorbent Trap	
Initial bakeout	120°C (24 hrs)	Initial bakeout	
Variable (24 hrs)			
After each run	120°C (5 min)	After each run	Variable (5 min)

10.2 GC/MS System

10.2.1 Optimize GC conditions for compound separation and sensitivity. Baseline separation of benzene and carbon tetrachloride on a 100% methyl polysiloxane stationary phase is an indication of acceptable chromatographic performance.

10.2.2 The following are the recommended gas chromatographic analytical conditions when using a 50-meter by 0.3-mm I.D., 1 μm film thickness fused silica column with refocusing on the column.

Item	Condition	
Carrier Gas:	Helium	
Flow Rate:	Generally 1-3 mL/min as recommended by manufacturer	
Temperature Program:	Initial Temperature:	-50°C
	Initial Hold Time:	2 min
	Ramp Rate:	8° C/min
	Final Temperature:	200°C
	Final Hold Time:	Until all target compounds elute.

10.2.3 The following are the recommended mass spectrometer conditions:

Item	Condition

Electron Energy:	70 Volts (nominal)
Mass Range:	35-300 amu [the choice of 35 amu excludes the detection of some target compounds such as methanol and formaldehyde, and the quantitation of others such as ethylene oxide, ethyl carbamate, etc. (see Table 2). Lowering the mass range and using special programming features available on modern gas chromatographs will be necessary in these cases, but are not considered here.
Scan Time:	To give at least 10 scans per peak, not to exceed 1 second per scan].

A schematic for a typical GC/MS analytical system is illustrated in Figure 15.

10.3 Analytical Sequence

10.3.1 Introduction. The recommended GC/MS analytical sequence for samples during each 24-hour time period is as follows:

- Perform instrument performance check using bromofluorobenzene (BFB).
- Initiate multi-point calibration or daily calibration checks.
- Perform a laboratory method blank.
- Complete this sequence for analysis of ≤20 field samples.

10.4 Instrument Performance Check

10.4.1 Summary. It is necessary to establish that a given GC/MS meets tuning and standard mass spectral abundance criteria prior to initiating any data collection. The GC/MS system is set up according to the manufacturer's specifications, and the mass calibration and resolution of the GC/MS system are then verified by the analysis of the instrument performance check standard, bromofluorobenzene (BFB).

10.4.2 Frequency. Prior to the analyses of any samples, blanks, or calibration standards, the Laboratory must establish that the GC/MS system meets the mass spectral ion abundance criteria for the instrument performance check standard containing BFB. The instrument performance check solution must be analyzed initially and once per 24-hour time period of operation.

The 24-hour time period for GC/MS instrument performance check and standards calibration (initial calibration or daily calibration check criteria) begins at the injection of the BFB which the laboratory records as documentation of a compliance tune.

10.4.3 Procedure. The analysis of the instrument performance check standard is performed by trapping 50 ng of BFB under the optimized preconcentration parameters. The BFB is introduced from a cylinder into the GC/MS via a sample loop valve injection system similar to that shown in Figure 13.

The mass spectrum of BFB must be acquired in the following manner. Three scans (the peak apex scan and the scans immediately preceding and following the apex) are acquired and averaged. Background subtraction is conducted using a single scan prior to the elution of BFB.

10.4.4 Technical Acceptance Criteria. Prior to the analysis of any samples, blanks, or calibration standards, the analyst must establish that the GC/MS system meets the mass spectral ion abundance criteria for the instrument performance check standard as specified in Table 3.

10.4.5 Corrective Action. If the BFB acceptance criteria are not met, the MS must be retuned. It may be necessary to clean the ion source, or quadrupoles, or take other necessary actions to achieve the acceptance criteria.

10.4.6 Documentation. Results of the BFB tuning are to be recorded and maintained as part of the instrumentation log.

10.5 Initial Calibration

10.5.1 Summary. Prior to the analysis of samples and blanks but after the instrument performance check standard criteria have been met, each GC/MS system must be calibrated at five concentrations that span the monitoring range of interest in an initial calibration sequence to determine instrument sensitivity and the linearity of GC/MS response for the target compounds. For example, the range of interest may be 2 to 20 ppbv, in which case the five concentrations would be 1, 2, 5, 10 and 25 ppbv.

One of the calibration points from the initial calibration curve must be at the same concentration as the daily calibration standard (e.g., 10 ppbv).

10.5.2 Frequency. Each GC/MS system must be recalibrated following corrective action (e.g., ion source cleaning or repair, column replacement, etc.) which may change or affect the initial calibration criteria or if the daily calibration acceptance criteria have not been met.

If time remains in the 24-hour time period after meeting the acceptance criteria for the initial calibration, samples may be analyzed.

If time does not remain in the 24-hour period after meeting the acceptance criteria for the initial calibration, a new analytical sequence shall commence with the analysis of the instrument performance check standard followed by analysis of a daily calibration standard.

10.5.3 Procedure. Verify that the GC/MS system meets the instrument performance criteria in Section 10.4.

The GC must be operated using temperature and flow rate parameters equivalent to those in Section 10.2.2. Calibrate the preconcentration-GC/MS system by drawing the standard into the system. Use one of the standards preparation techniques described under Section 9.2 or equivalent.

A minimum of five concentration levels are needed to determine the instrument sensitivity and linearity. One of the calibration levels should be near the detection level for the compounds of interest. The calibration range should be chosen so that linear results are obtained as defined in Sections 10.5.1 and 10.5.5.

Quantitation ions for the target compounds are shown in Table 2. The primary ion should be used unless interferences are present, in which case a secondary ion is used.

10.5.4 Calculations.

[Note: In the following calculations, an internal standard approach is used to calculate response factors. The area response used is that of the primary quantitation ion unless otherwise stated.]

10.5.4.1 Relative Response Factor (RRF). Calculate the relative response factors for each target compound relative to the appropriate internal standard (i.e., standard with the nearest retention time) using the following equation:

$$RRF = \frac{A_x C_{is}}{A_{is} C_x}$$

where: RRF = Relative response factor.
A_x = Area of the primary ion for the compound to be measured, counts.
A_{is} = Area of the primary ion for the internal standard, counts.
C_{is} = Concentration of internal standard spiking mixture, ppbv.
C_x = Concentration of the compound in the calibration standard, ppbv.

[Note: The equation above is valid under the condition that the volume of internal standard spiking mixture added in all field and QC analyses is the same from run to run, and that the volume of field and QC sample introduced into the trap is the same for each analysis. C_{is} and C_x must be in the same units.]

10.5.4.2 Mean Relative Response Factor. Calculate the mean RRF for each compound by averaging the values obtained at the five concentrations using the following equation:

$$\overline{RRF} = \sum_{i=1}^{n} \frac{x_i}{n}$$

where: $\overline{RRF}$ = Mean relative response factor.
x_i = RRF of the compound at concentration i.
n = Number of concentration values, in this case 5.

10.5.4.3 Percent Relative Standard Deviation (%RSD). Using the RRFs from the initial calibration, calculate the %RSD for all target compounds using the following equations:

$$\%RSD = \frac{SD_{RRF}}{\overline{RRF}} \times 100$$

and

$$SD_{RRF} = \sqrt{\sum_{i=1}^{N} \frac{(RRF_i - \overline{RRF})^2}{N - 1}}$$

where: SD_{RRF} = Standard deviation of initial response factors (per compound).
RRF_i = Relative response factor at a concentration level i.
$\overline{RRF}$ = Mean of initial relative response factors (per compound).

10.5.4.4 Relative Retention Times (RRT). Calculate the RRTs for each target compound over the initial calibration range using the following equation:

$$RRT = \frac{RT_c}{RT_{is}}$$

where: RT_c = Retention time of the target compound, seconds
RT_{is} = Retention time of the internal standard, seconds.

10.5.4.5 Mean of the Relative Retention Times ($\overline{RRT}$). Calculate the mean of the relative retention times ($\overline{RRT}$) for each analyte target compound over the initial calibration range using the following equation:

$$\overline{RRT} = \sum_{i=1}^{n} \frac{RRT}{n}$$

where: $\overline{RRT}$ = Mean relative retention time for the target compound for each initial calibration standard.

RRT = Relative retention time for the target compound at each calibration level.

10.5.4.6 Tabulate Primary Ion Area Response (Y) for Internal Standard. Tabulate the area response (Y) of the primary ions (see Table 2) and the corresponding concentration for each compound and internal standard.

10.5.4.7 Mean Area Response ($\overline{Y}$) for Internal Standard. Calculate the mean area response ($\overline{Y}$) for each internal standard compound over the initial calibration range using the following equation:

$$\overline{Y} = \sum_{i=1}^{n} \frac{Y_i}{n}$$

where: $\overline{Y}$ = Mean area response.

Y = Area response for the primary quantitation ion for the internal standard for each initial calibration standard.

10.5.4.8 Mean Retention Times ($\overline{RT}$). Calculate the mean of the retention times ($\overline{RT}$) for each internal standard over the initial calibration range using the following equation:

$$\overline{RT} = \sum_{i=1}^{n} \frac{RT_i}{n}$$

where: $\overline{RT}$ = Mean retention time, seconds

RT = Retention time for the internal standard for each initial calibration standard, seconds.

10.5.5 Technical Acceptance Criteria for the Initial Calibration.

10.5.5.1 The calculated %RSD for the RRF for each compound in the calibration table must be less than 30% with at most two exceptions up to a limit of 40%.

[Note: This exception may not be acceptable for all projects. Many projects may have a specific target list of compounds which would require the lower limit for all compounds.]

10.5.5.2 The RRT for each target compound at each calibration level must be withiin 0.06 RRT units of the mean RRT for the compound.

10.5.5.3 The area response Y of at each calibration level must be within 40% of the mean area response $\overline{Y}$ over the initial calibration range for each internal standard.

10.5.5.4 The retention time shift for each of the internal standards at each calibration level must be within 20 s of the mean retention time over the initial calibration range for each internal standard.

10.5.6 Corrective Action.

10.5.6.1 Criteria. If the initial calibration technical acceptance criteria are not met, inspect the system for problems. It may be necessary to clean the ion source, change the column, or take other corrective actions to meet the initial calibration technical acceptance criteria.

10.5.6.2 Schedule. Initial calibration acceptance criteria *must* be met before any field samples, performance evaluation (PE) samples, or blanks are analyzed.

10.6 Daily Calibration

10.6.1 Summary. Prior to the analysis of samples and blanks but after tuning criteria have been met, the initial calibration of each GC/MS system must be routinely checked by analyzing a daily calibration standard to ensure that the instrument continues to remain under control. The daily calibration standard, which is the nominal 10 ppbv level calibration standard, should contain all the target compounds.

10.6.2 Frequency. A check of the calibration curve must be performed once every 24 hours on a GC/MS system that has met the tuning criteria. The daily calibration sequence starts with the injection of the BFB. If the BFB analysis meets the ion abundance criteria for BFB, then a daily calibration standard may be analyzed.

10.6.3 Procedure. The mid-level calibration standard (10 ppbv) is analyzed in a GC/MS system that has met the tuning and mass calibration criteria following the same procedure in Section 10.5.

10.6.4 Calculations. Perform the following calculations.

[Note: As indicated earlier, the area response of the primary quantitation ion is used unless otherwise stated.]

10.6.4.1 Relative Response Factor (RRF). Calculate a relative response factor (RRF) for each target compound using the equation in Section 10.5.4.1.

10.6.4.2 Percent Difference (%D). Calculate the percent difference in the RRF of the daily RRF (24-hour) compared to the mean RRF in the most recent initial calibration. Calculate the %D for each target compound using the following equation:

$$\%D = \frac{RRF_c - \overline{RRF_i}}{\overline{RRF_i}} \times 100$$

where: RRF_c = RRF of the compound in the continuing calibration standard.

$\overline{RRF_i}$ = Mean RRF of the compound in the most recent initial calibration.

10.6.5 Technical Acceptance Criteria. The daily calibration standard must be analyzed at the concentration level and frequency described in this Section 10.6 and on a GC/MS system meeting the BFB instrument performance check criteria (see Section 10.4).

The %D for each target compound in a daily calibration sequence must be within ±30 percent in order to proceed with the analysis of samples and blanks. A control chart showing %D values should be maintained.

10.6.6 Corrective Action. If the daily calibration technical acceptance criteria are not met, inspect the system for problems. It may be necessary to clean the ion source, change the column, or take other corrective actions to meet the daily calibration technical acceptance criteria.

Daily calibration acceptance criteria must be met before any field samples, performance evaluation (PE) samples, or blanks are analyzed. If the % D criteria are not met, it will be necessary to rerun the daily calibration sample.

10.7 Blank Analyses

10.7.1 Summary. To monitor for possible laboratory contamination, laboratory method blanks are analyzed at least once in a 24-hour analytical sequence. All steps in the analytical procedure are performed on the blank

using all reagents, standards, equipment, apparatus, glassware, and solvents that would be used for a sample analysis.

A laboratory method blank (LMB) is an unused, certified canister that has not left the laboratory. The blank canister is pressurized with humidified, ultra-pure zero air and carried through the same analytical procedure as a field sample. The injected aliquot of the blank must contain the same amount of internal standards that are added to each sample.

10.7.2 Frequency. The laboratory method blank must be analyzed after the calibration standard(s) and before any samples are analyzed.

Whenever a high concentration sample is encountered (i.e., outside the calibration range), a blank analysis should be performed immediately after the sample is completed to check for carryover effects.

10.7.3 Procedure. Fill a cleaned and evacuated canister with humidified zero air (RH >20 percent, at 25°C). Pressurize the contents to 2 atm.

The blank sample should be analyzed using the same procedure outlined under Section 10.8.

10.7.4 Calculations. The blanks are analyzed similar to a field sample and the equations in Section 10.5.4 apply.

10.7.5 Technical Acceptance Criteria. A blank canister should be analyzed daily.

The area response for each internal standard (IS) in the blank must be within ±40 percent of the mean area response of the IS in the most recent valid calibration.

The retention time for each of the internal standards must be within ±0.33 minutes between the blank and the most recent valid calibration.

The blank should not contain any target analyte at a concentration greater than its quantitation level (three times the MDL as defined in Section 11.2) and should not contain additional compounds with elution characteristics and mass spectral features that would interfere with identification and measurement of a method analyte.

10.7.6 Corrective Action. If the blanks do not meet the technical acceptance criteria, the analyst should consider the analytical system to be out of control. It is the responsibility of the analyst to ensure that contaminants in solvents, reagents, glassware, and other sample storage and processing hardware that lead to discrete artifacts and/or elevated baselines in gas chromatograms be eliminated. If contamination is a problem, the source of the contamination must be investigated and appropriate corrective measures need to be taken and documented before further sample analysis proceeds.

If an analyte in the blank is found to be out of control (i.e., contaminated) and the analyte is also found in associated samples, those sample results should be "flagged" as possibly contaminated.

10.8 Sample Analysis

10.8.1 Summary. An aliquot of the air sample from a canister (e.g., 500 mL) is preconcentrated and analyzed by GC/MS under conditions stated in Sections 10.1 and 10.2. If using the multisorbent/dry purge approach, adjust the dry purge volume to reduce water effects in the analytical system to manageable levels.

[Note: The analyst should be aware that pressurized samples of high humidity samples will contain condensed water. As a result, the humidity of the sample released from the canister during analysis will vary

in humidity, being lower at the higher canister pressures and increasing in humidity as the canister pressures decreases. Storage integrity of water soluble compounds may also be affected.]

10.8.2 Frequency. If time remains in the 24-hour period in which an initial calibration is performed, samples may be analyzed without analysis of a daily calibration standard.

If time does not remain in the 24-hour period since the injection of the instrument performance check standard in which an initial calibration is performed, both the instrument performance check standard and the daily calibration standard should be analyzed before sample analysis may begin.

10.8.3 Procedure for Instrumental Analysis. Perform the following procedure for analysis.

10.8.3.1 All canister samples should be at temperature equilibrium with the laboratory.

10.8.3.2 Check and adjust the mass flow controllers to provide correct flow rates for the system.

10.8.3.3 Connect the sample canister to the inlet of the GC/MS analytical system, as shown in Figure 15 [Figure 16 shows an alternate two stage concentrator using multisorbent traps followed by a trap cooled by a closed cycle cooler (15)]. The desired sample flow is established through the six-port chromatographic valve and the preconcentrator to the downstream flow controller. The absolute volume of sample being pulled through the trap must be consistent from run to run.

10.8.3.4 Heat/cool the GC oven and cryogenic or adsorbent trap to their set points. Assuming a six-port value is being used, as soon as the trap reaches its lower set point, the six-port chromatographic valve is cycled to the trap position to begin sample collection. Utilize the sample collection time which has been optimized by the analyst.

10.8.3.5 Use the arrangement shown in Figure 13, (i.e., a gastight syringe or some alternate method) introduce an internal standard during the sample collection period. Add sufficient internal standard equivalent to 10 ppbv in the sample. For example, a 0.5 mL volume of a mixture of internal standard compounds, each at 10 ppmv concentration, added to a sample volume of 500 mL, will result in 10 ppbv of each internal standard in the sample.

10.8.3.6 After the sample and internal standards are preconcentrated on the trap, the GC sampling valve is cycled to the inject position and the trap is swept with helium and heated. Assuming a focusing trap is being used, the trapped analytes are thermally desorbed onto a focusing trap and then onto the head of the capillary column and are separated on the column using the GC oven temperature program. The canister valve is closed and the canister is disconnected from the mass flow controller and capped. The trap is maintained at elevated temperature until the beginning of the next analysis.

10.8.3.7 Upon sample injection onto the column, the GC/MS system is operated so that the MS scans the atomic mass range from 35 to 300 amu. At least ten scans per eluting chromatographic peak should be acquired. Scanning also allows identification of unknown compounds in the sample through searching of library spectra.

10.8.3.8 Each analytical run must be checked for saturation. The level at which an individual compound will saturate the detection system is a function of the overall system sensitivity and the mass spectral characteristics of that compound.

10.8.3.9 Secondary ion quantitation is allowed only when there are sample matrix interferences with the primary ion. If secondary ion quantitation is performed, document the reasons in the laboratory record book.

10.8.4 Calculations. The equation below is used for calculating concentrations.

$$C_x = \frac{A_x C_{is} DF}{A_{is} \overline{RRF}}$$

where: C_x = Compound concentration, ppbv.

A_x = Area of the characteristic ion for the compound to be measured, counts.

A_{is} = Area of the characteristic ion for the specific internal standard, counts.

C_{is} = Concentration of the internal standard spiking mixture, ppbv

.

$\overline{RRF}$ = Mean relative response factor from the initial calibration.

DF = Dilution factor calculated as described in section 2. If no dilution is performed, DF = 1.

[Note: The equation above is valid under the condition that the volume (~500 µL) of internal standard spiking mixture added in all field and QC analyses is the same from run to run, and that the volume (~500 mL) of field and QC sample introduced into the trap is the same for each analysis.]

10.8.5 Technical Acceptance Criteria.

[Note: If the most recent valid calibration is an initial calibration, internal standard area responses and RTs in the sample are evaluated against the corresponding internal standard area responses and RTs in the mid level standard (10 ppbv) of the initial calibration.]

10.8.5.1 The field sample must be analyzed on a GC/MS system meeting the BFB tuning, initial calibration, and continuing calibration technical acceptance criteria at the frequency described in Sections 10.4, 10.5 and 10.6.

10.8.5.2 The field samples must be analyzed along with a laboratory method blank that met the blank technical acceptance criteria.

10.8.5.3 All of the target analyte peaks should be within the initial calibration range.

10.8.5.4 The retention time for each internal standard must be within ±0.33 minutes of the retention time of the internal standard in the most recent valid calibration.

10.8.6 Corrective Action. If the on-column concentration of any compound in any sample exceeds the initial calibration range, an aliquot of the original sample must be diluted and reanalyzed. Guidance in performing dilutions and exceptions to this requirement are given below.

- Use the results of the original analysis to determine the approximate dilution factor required to get the largest analyte peak within the initial calibration range.
- The dilution factor chosen should keep the response of the largest analyte peak for a target compound in the upper half of the initial calibration range of the instrument.

[Note: Analysis involving dilution should be reported with a dilution factor and nature of the dilution gas.]

10.8.6.1 Internal standard responses and retention times must be evaluated during or immediately after data acquisition. If the retention time for any internal standard changes by more than 20 sec from the latest daily (24-hour) calibration standard (or mean retention time over the initial calibration range), the GC/MS system must be inspected for malfunctions, and corrections made as required.

10.8.6.2 If the area response for any internal standard changes by more than ±40 percent between the sample and the most recent valid calibration, the GC/MS system must be inspected for malfunction and

corrections made as appropriate. When corrections are made, reanalysis of samples analyzed while the system was malfunctioning is necessary.

10.8.6.3 If, after reanalysis, the area responses or the RTs for all internal standards are inside the control limits, then the problem with the first analysis is considered to have been within the control of the Laboratory. Therefore, submit only data from the analysis with SICPs within the limits. This is considered the initial analysis and should be reported as such on all data deliverables.

11. Requirements for Demonstrating Method Acceptability for VOC Analysis from Canisters

11.1 Introduction

11.1.1 There are three performance criteria which must be met for a system to qualify under Compendium Method TO-15. These criteria are: the method detection limit of ≤0.5 ppbv, replicate precision within 25 percent, and audit accuracy within 30 percent for concentrations normally expected in contaminated ambient air (0.5 to 25 ppbv).

11.1.2 Either SIM or SCAN modes of operation can be used to achieve these criteria, and the choice of mode will depend on the number of target compounds, the decision of whether or not to determine tentatively identified compounds along with other VOCs on the target list, as well as on the analytical system characteristics.

11.1.3 Specific criteria for each Title III compound on the target compound list must be met by the analytical system. These criteria were established by examining summary data from EPA's Toxics Air Monitoring System Network and the Urban Air Toxics Monitoring Program network. Details for the determination of each of the criteria follow.

11.2 Method Detection Limit

11.2.1 The procedure chosen to define the method detection limit is that given in the *Code of Federal Regulations* (40 CFR 136 Appendix B).

11.2.2 The method detection limit is defined for each system by making seven replicate measurements of the compound of interest at a concentration near (within a factor of five) the expected detection limit, computing the standard deviation for the seven replicate concentrations, and multiplying this value by 3.14 (i.e., the Student's t value for 99 percent confidence for seven values). Employing this approach, the detection limits given in Table 4 were obtained for some of the VOCs of interest.

11.3 Replicate Precision

11.3.1 The measure of replicate precision used for this program is the absolute value of the difference between replicate measurements of the sample divided by the average value and expressed as a percentage as follows:

$$\text{percent difference} = \frac{|x_1 - x_2|}{\bar{x}} \times 100$$

where:

x_1 = First measurement value.

x_2 = Second measurement value.

$\bar{x}$ = Average of the two values.

11.3.2 There are several factors which may affect the precision of the measurement. The nature of the compound of interest itself such as molecular weight, water solubility, polarizability, etc., each have some effect on the precision, for a given sampling and analytical system. For example, styrene, which is classified as a polar VOC, generally shows slightly poorer precision than the bulk of nonpolar VOCs. A primary influence on precision is the concentration level of the compound of interest in the sample, i.e., the precision degrades as the concentration approaches the detection limit. A conservative measure was obtained from replicate analysis of "real world" canister samples from the TAMS and UATMP networks. These data are summarized in Table 5 and suggest that a replicate precision value of 25 percent can be achieved for each of the target compounds.

11.4 Audit Accuracy

11.4.1 A measure of analytical accuracy is the degree of agreement with audit standards. Audit accuracy is defined as the difference between the nominal concentration of the audit compound and the measured value divided by the audit value and expressed as a percentage, as illustrated in the following equation:

$$\text{Audit Accuracy, \%} = \frac{\text{Spiked Value} - \text{Observed Value}}{\text{Spiked Value}} \times 100$$

11.4.2 Audit accuracy results for TAMS and UATMP analyses are summarized in Table 6 and were used to form the basis for a selection of 30 percent as the performance criterion for audit accuracy.

12. References

1. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air: Method TO-14A, Second Edition,* U. S. Environmental Protection Agency, Research Triangle Park, NC, EPA 600/625/R-96/010b, January 1997.

2. Winberry, W. T., Jr., et al., *Statement-of-Work (SOW) for the Analysis of Air Toxics From Superfund Sites*, U. S. Environmental Protection Agency, Office of Solid Waste, Contract Laboratory Program, Washington, D.C., Draft Report, June 1990.

3. Coutant, R.W., *Theoretical Evaluation of Stability of Volatile Organic Chemicals and Polar Volatile Organic Chemicals in Canisters*, U. S. Environmental Protection Agency, EPA Contract No. 68-DO-0007, Work Assignment No. 45, Subtask 2, Battelle, Columbus, OH, June 1993.

4. Kelly, T.J., Mukund, R., Gordon, S.M., and Hays, M.J., *Ambient Measurement Methods and Properties of the 189 Title III Hazardous Air Pollutants*, U. S. Environmental Protection Agency, EPA Contract No. 68-DO-0007, Work Assignment 44, Battelle, Columbus, OH, March 1994.

5. Kelly T. J. and Holdren, M.W., "Applicability of Canisters for Sample Storage in the Determination of Hazardous Air Pollutants," *Atmos. Environ.*, Vol. 29, 2595-2608, May 1995.

6. Kelly, T.J., Callahan, P.J., Pleil, J.K., and Evans, G.E., "Method Development and Field Measurements for Polar Volatile Organic Compounds in Ambient Air," *Environ. Sci. Technol.*, Vol. 27, 1146-1153, 1993.

7. McClenny, W.A., Oliver, K.D. and Daughtrey, E.H.., Jr. "Dry Purging of Solid Adsorbent Traps to Remove Water Vapor Before Thermal Desorption of Trace Organic Gases," *J. Air and Waste Manag. Assoc.,* Vol. 45, 792-800, June 1995.

8. Whitaker, D.A., Fortmann, R.C. and Lindstrom, A.B. "Development and Testing of a Whole Air Sampler for Measurement of Personal Exposures to Volatile Organic Compounds," *Journal of Exposure Analysis and Environmental Epidemiology*, Vol. 5, No. 1, 89-100, January 1995.

9. Pleil, J.D. and Lindstrom, A.B., "Collection of a Single Alveolar Exhaled Breath for Volatile Organic Compound Analysis," *American Journal of Industrial Medicine*, Vol. 28, 109-121, 1995.

10. Pleil, J.D. and McClenny, W.A., "Spatially Resolved Monitoring for Volatile Organic Compounds Using Remote Sector Sampling," *Atmos. Environ.,* Vol. 27A, No. 5, 739-747, August 1993.

11. Holdren, M.W., et al., Unpublished Final Report, EPA Contract 68-DO-0007, Battelle, Columbus, OH. Available from J.D. Pleil, MD-44, U. S. Environmental Protection Agency, Research Triangle Park, NC, 27711, 919-541-4680.

12. Morris, C.M., Burkley, R.E. and Bumgarner, J.E., "Preparation of Multicomponent Volatile Organic Standards Using Dilution Bottles," *Anal. Letts*., Vol. 16 (A20), 1585-1593, 1983.

13. Pollack, A.J., Holdren, M.W., "Multi-Adsorbent Preconcentration and Gas Chromatographic Analysis of Air Toxics With an Automated Collection/Analytical System," in the *Proceedings of the 1990 EPA/A&WMA International Symposium of Measurement of Toxic and Related Air Pollutants*, U. S. Environmental Protection Agency, Research Triangle Park, NC, EPA/600/9-90-026, May 1990.

14. Stephenson, J.H.M., Allen, F., Slagle, T., "Analysis of Volatile Organics in Air via Water Methods" in *Proceedings of the 1990 EPA/A&WMA International Symposium on Measurement of Toxic and Related Air Pollutants*, U. S. Environmental Protection Agency, Research Triangle Park, NC, EPA 600/9-90-026, May 1990.

15. Oliver, K. D., Adams, J. R., Davehtrey, E. H., Jr., McClenny, W. A., Young, M. J., and Parade, M. A., "Techniques for Monitoring Toxices VOCs in Air: Sorbent Preconcentration Closed-Cycle Cooler Cryofocusing, and GC/MS Analysis," *Environ. Sci. Technol.*, Vol. 30, 1938-1945, 1996.

APPENDIX A.

LISTING OF SOME COMMERCIAL WATER MANAGEMENT SYSTEMS USED WITH AUTOGC SYSTEMS

Tekmar Dohrman Company
7143 East Kemper Road
Post Office Box 429576
Cincinnati, Ohio 45242-9576
(513) 247-7000
(513) 247-7050 (Fax)
(800) 543-4461
[Moisture control module]

Entech Laboratory Automation
950 Enchanted Way No. 101
Simi Valley, California 93065
(805) 527-5939
(805) 527-5687 (Fax)
[Microscale Purge and Trap]

Dynatherm Analytical Instruments
Post Office Box 159
Kelton, Pennsylvania 19346
(215) 869-8702
(215) 869-3885 (Fax)
[Thermal Desorption System]

XonTech Inc.
6862 Hayenhurst Avenue
Van Nuys, CA 91406
(818) 787-7380
(818) 787-4275 (Fax)
[Multi-adsorbent trap/dry purge]

Graseby
500 Technology Ct.
Smyrna, Georgia 30082
(770) 319-9999
(770) 319-0336 (Fax)
(800) 241-6898
[Controlled Desorption Trap]

Varian Chromatography System
2700 Mitchell Drive
Walnut Creek, California 94898
(510) 945-2196
(510) 945-2335 (FAX)
[Variable Temperature Adsorption Trap]

APPENDIX B.

COMMENT ON CANISTER CLEANING PROCEDURES

The canister cleaning procedures given in Section 8.4 require that canister pressure be reduced to <0.05mm Hg before the cleaning process is complete. Depending on the vacuum system design (diameter of connecting tubing, valve restrictions, etc.) and the placement of the vacuum gauge, the achievement of this value may take several hours. In any case, the pressure gauge should be placed near the canisters to determine pressure. The objective of requiring a low pressure evacuation during canister cleaning is to reduce contaminants. If canisters can be routinely certified (<0.2 ppbv for target compounds) while using a higher vacuum, then this criteria can be relaxed. However, the ultimate vacuum achieved during cleaning should always be <0.2mm Hg.

Canister cleaning as described in Section 8.4 and illustrated in Figure 10 requires components with special features. The vacuum gauge shown in Figure 10 must be capable of measuring 0.05mm Hg with less than a 20% error. The vacuum pump used for evacuating the canister must be noncontaminating while being capable of achieving the 0.05 mm Hg vacuum as monitored near the canisters. Thermoelectric vacuum gauges and turbomolecular drag pumps are typically being used for these two components.

An alternate to achieving the canister certification requirement of <0.2 ppbv for all target compounds is the criteria used in Compendium Method TO-12 that the total carbon count be <10ppbC. This check is less expensive and typically more exacting than the current certification requirement and can be used if proven to be equivalent to the original requirement. This equivalency must be established by comparing the total nonmethane organic carbon (TNMOC) expressed in ppbC to the requirement that individual target compounds be <0.2 ppbv for a series of analytical runs.

APPENDIX C.

LISTING OF COMMERCIAL MANUFACTURERS AND RE-SUPPLIERS OF SPECIALLY-PREPARED CANISTERS

BRC/Rasmussen
17010 NW Skyline Blvd.
Portland, Oregon 97321
(503) 621-1435

Meriter
1790 Potrero Drive
San Jose, CA 95124
(408) 265-6482

Restek Corporation
110 Benner Circle
Bellefonte, PA 16823-8812
(814) 353-1300
(800) 356-1688

Scientific Instrumentation Specialists
P.O. Box 8941
815 Courtney Street
Moscow, ID 83843
(208) 882-3860

Graseby
500 Technology Ct.
Smyrna, Georgia 30082
(404) 319-9999
(800) 241-6898

XonTech Inc.
6862 Hayenhurst Avenue
Van Nuys, CA 91406
(818) 787-7380

APPENDIX D.

LISTING OF COMMERCIAL SUPPLIERS OF PERMEATION TUBES AND SYSTEMS

Kin-Tek
504 Laurel St.
Lamarque, Texas 77568
(409) 938-3627
(800) 326-3627

Vici Metronics, Inc.
2991 Corvin Drive
Santa Clara, CA 95051
(408) 737-0550

Analytical Instrument Development, Inc.
Rt. 41 and Newark Rd.
Avondale, PA 19311
(215) 268-3181

Ecology Board, Inc.
9257 Independence Ave.
Chatsworth, CA 91311
(213) 882-6795

Tracor, Inc.
6500 Tracor Land
Austin, TX
(512) 926-2800

Metronics Associates, Inc.
3201 Porter Drive
Standford Industrial Park
Palo Alto, CA 94304
(415) 493-5632

TABLE 1. VOLATILE ORGANIC COMPOUNDS ON THE TITLE III CLEAN AIR AMENDMENT LIST--MEMBERSHIP IN COMPENDIUM METHOD TO-14A LIST AND THE SOW-CLP LIST OF VOCs

Compound	CAS No.	BP (°C)	v.p. (mmHg)[1]	MW[1]	TO-14A	CLP-SOW
Methyl chloride (chloromethane); CH3Cl	74-87-3	-23.7	3.8 x 10	50.5	X	X
Carbonyl sulfide; COS	463-58-1	-50.0	3.7 x 10	60.1		
Vinyl chloride (chloroethene); C2H3Cl	75-01-4	-14.0	3.2 x 10	62.5	X	X
Diazomethane; CH2N2	334-88-3	-23.0	2.8 x 10	42.1		
Formaldehyde; CH2O	50-00-0	-19.5	2.7 x 10	30		
1,3-Butadiene; C4H6	106-99-0	-4.5	2.0 x 10	54		X
Methyl bromide (bromomethane); CH3Br	74-83-9	3.6	1.8 x 10	94.9	X	X
Phosgene; CCl2O	75-44-5	8.2	1.2 x 10	99		
Vinyl bromide (bromoethene); C2H3Br	593-60-2	15.8	1.1 x 10	107		
Ethylene oxide; C2H4O	75-21-8	10.7	1.1 x 10	44		
Ethyl chloride (chloroethane); C2H5Cl	75-00-3	12.5	1.0 x 10	64.5	X	X
Acetaldehyde (ethanal); C2H4O	75-07-0	21.0	952	44		
Vinylidene chloride (1,1-dichloroethylene); C2H2Cl2	75-35-4	31.7	500	97	X	X
Propylene oxide; C3H6O	75-56-9	34.2	445	58		
Methyl iodide (iodomethane); CH3I	74-88-4	42.4	400	141.9		
Methylene chloride; CH2Cl2	75-09-2	40.0	349	84.9	X	X
Methyl isocyanate; C2H3NO	624-83-9	59.6	348	57.1		
Allyl chloride (3-chloropropene); C3H5Cl	107-05-1	44.5	340	76.5	X	X
Carbon disulfide; CS2	75-15-0	46.5	260	76		
Methyl tert-butyl ether; C5H12O	1634-04-4	55.2	249	86		
Propionaldehyde; C2H5CHO	123-38-6	49.0	235	58.1		
Ethylidene dichloride (1,1-dichloroethane); C2H4Cl2	75-34-3	57.0	230	99	X	

TABLE 1. (continued)

Compound	CAS No.	BP (°C)	v.p. (mmHg)[1]	MW[1]	TO-14A	CLP-SOW
Chloroprene (2-chloro-1,3-butadiene); C4H5Cl	126-99-8	59.4	226	88.5		
Chloromethyl methyl ether; C2H5ClO	107-30-2	59.0	224	80.5		
Acrolein (2-propenal); C3H4O	107-02-8	52.5	220	56		X
1,2-Epoxybutane (1,2-butylene oxide); C4H8O	106-88-7	63.0	163	72		
Chloroform; CHCl3	67-66-3	61.2	160	119	X	X
Ethyleneimine (aziridine); C2H5N	151-56-4	56	160.0	43		
1,1-Dimethylhydrazine; C2H8N2	57-14-7	63	157.0	60.0		
Hexane; C6H14	110-54-3	69.0	120	86.2	X	
1,2-Propyleneimine (2-methylaziridine); C3H7N	75-55-8	66.0	112	57.1		
Acrylonitrile (2-propenenitrile); C3H3N	107-13-1	77.3	100	53	X	
Methyl chloroform (1,1,1-trichloroethane); C2H3Cl3	71-55-6	74.1	100	133.4	X	X
Methanol; CH4O	67-56-1	65.0	92.0	32		X
Carbon tetrachloride; CCl4	56-23-5	76.7	90.0	153.8	X	X
Vinyl acetate; C4H6O2	108-05-4	72.2	83.0	86		X
Methyl ethyl ketone (2-butanone); C4H8O	78-93-3	79.6	77.5	72		X
Benzene; C6H6	71-43-2	80.1	76.0	78	X	X
Acetonitrile (cyanomethane); C2H3N	75-05-8	82	74.0	41.0		X
Ethylene dichloride (1,2-dichloroethane); C2H4Cl2	107-06-2	83.5	61.5	99	X	X
Triethylamine; C6H15N	121-44-8	89.5	54.0	101.2		
Methylhydrazine; CH6N2	60-34-4	87. 8	49.6	46.1		
Propylene dichloride (1,2-dichloropropane); C3H6Cl2	78-87-5	97.0	42.0	113	X	X
2,2,4-Trimethyl pentane C8H18	540-84-1	99.2	40.6	114		
1,4-Dioxane (1,4-Diethylene oxide); C4H8O2	123-91-1	101	37.0	88		
Bis(chloromethyl) ether; C2H4Cl2O	542-88-1	104	30.0	115		
Ethyl acrylate; C5H8O2	140-88-5	100	29.3	100		
Methyl methacrylate; C5H8O2	80-62-6	101	28.0	100.1		

TABLE 1. (continued)

Compound	CAS No.	BP (°C)	v.p. (mmgHg)[1]	MW[1]	TO-14A	CLP-SOW
Methyl methacrylate; C5H8O2	80-62-101	101	28.0	100.1		
1,3-Dichloropropene; C3H4Cl2 (cis)	542-75-6	112	27.8	111	X	X
Toluene; C7H8	108-88-3	111	22.0	92	X	X
Trichloroethylene; C2HCl3	79-01-6	87.0	20.0	131.4	X	X
1,1,2-Trichloroethane; C2H3Cl3	79-00-5	114	19.0	133.4	X	X
Tetrachloroethylene; C2Cl4	127-18-4	121	14.0	165.8	X	X
Epichlorohydrin (1-chloro-2,3-epoxy propane); C3H5ClO	106-89-8	117	12.0	92.5		
Ethylene dibromide (1,2-dibromoethane); C2H4Br2	106-93-4	132	11.0	187.9	X	X
N-Nitroso-N-methylurea; C2H5N3O2	684-93-5	124	10.0	103		
2-Nitropropane; C3H7NO2	79-46-9	120	10.0	89		
Chlorobenzene; C6H5Cl	108-90-7	132	8.8	112.6	X	X
Ethylbenzene; C8H10	100-41-4	136	7.0	106	X	X
Xylenes (isomer & mixtures); C8H10	1330-20-7	142	6.7	106.2	X	X
Styrene; C8H8	100-42-5	145	6.6	104	X	X
p-Xylene; C8H10	106-42-3	138	6.5	106.2	X	X
m-Xylene; C8H10	108-38-3	139	6.0	106.2	X	X
Methyl isobutyl ketone (hexone); C6H12O	108-10-1	117	6.0	100.2		
Bromoform (tribromomethane); CHBr3	75-25-2	149	5.6	252.8		
l,l,2,2-Tetrachloroethane; C2H2Cl4	79-34-5	146	5.0	167.9	X	X
o-Xylene; C8H10	95-47-6	144	5.0	106.2	X	X
Dimethylcarbamyl chloride; C3H6ClNO	79-44-7	166	4.9	107.6		
N-Nitrosodimethylamine; C2H6N2O	62-75-9	152	3.7	74		
Beta-Propiolactone; C3H4O2	57-57-8	Decomposes at 162	3.4	72		
Cumene (isopropylbenzene); C9Hl2	98-82-8	153	3.2	120		

TABLE 1. (continued)

Compound	CAS No.	BP (°C)	v.p. (mmHg)[1]	MW[1]	TO-14A	CLP-SOW
Cumene (isopropylbenzene); C9H12	98-82-8	153	3.2	120		
Acrylic acid; C3H4O2	79-10-7	141	3.2	72		
N,N-Dimethylformamide; C3H7NO	68-12-2	153	2.7	73		
1,3-Propane sultone; C3H6O3S	1120-71-4	180/30mm	2.0	122.1		
Acetophenone; C8H8O	98-86-2	202	1.0	120		
Dimethyl sulfate; C2H6O4S	77-78-1	188	1.0	126.1		
Benzyl chloride (a-chlorotoluene); C7H7Cl	100-44-7	179	1.0	126.6	X	X
1,2-Dibromo-3-chloropropane; C3H5Br2Cl	96-12-8	196	0.80	236.4		
Bis(2-Chloroethyl)ether; C4H8Cl2O	111-44-4	178	0.71	143		
Chloroacetic acid; C2H3ClO2	79-11-8	189	0.69	94.5		
Aniline (aminobenzene); C6H7N	62-53-3	184	0.67	93		
1,4-Dichlorobenzene (p-); C6H4Cl2	106-46-7	173	0.60	147	X	X
Ethyl carbamate (urethane); C3H7NO2	51-79-6	183	0.54	89		
Acrylamide; C3H5NO	79-06-1	125/25 mm	0.53	71		
N,N-Dimethylaniline; C8H11N	121-69-7	192	0.50	121		
Hexachloroethane; C2Cl6	67-72-1	Sublimes at 186	0.40	236.7		
Hexachlorobutadiene; C4Cl6	87-68-3	215	0.40	260.8	X	X
Isophorone; C9H14O	78-59-1	215	0.38	138.2		
N-Nitrosomorpholine; C4H8N2O2	59-89-2	225	0.32	116.1		
Styrene oxide; C8H8O	96-09-3	194	0.30	120.2		
Diethyl sulfate; C4H10O4S	64-67-5	208	0.29	154		
Cresylic acid (cresol isomer mixture);C7H8O	1319-77-3	202	0.26	108		
o-Cresol; C7H8O	95-48-7	191	0.24	108		
Catechol (o-hydroxyphenol); C6H6O2	120-80-9	240	0.22	110		
Phenol; C6H6O	108-95-2	182	0.20	94		

TABLE 1. (continued)

Compound	CAS No.	BP (°C)	v.p. (mmHg)[1]	MW[1]	TO-14A	CLP-SOW
Catechol (o-hydroxyphenol); C6H6O2	120-80-9	240	0.22	110		
Phenol; C6H6O	108-95-2	182	0.20	94		
1,2,4-Trichlorobenzene; C6H3Cl3	120-82-1	213	0.18	181.5	X	X
nitrobenzene C6H5NO2	98-95-3	211	0.15	123		

[1]Vapor pressure (v.p.), boiling point (BP) and molecularweight (MW) data from:
(a)D. L. Jones and J. bursey, "Simultaneous Control of PM-10 and Hazardous Air Pollutants II: Rationale for Selection of Hazardous Air Pollutants as Potential Particulate Matter," Report EPA-452/R-93/013, U. S. Environmental Protection Agency, Research Triangle Park, NC. October 1992;
(b)R. C. Weber, P. A. Parker, and M. Bowser. Vapor Pressure Distribution of Selected Organic Chemicals, Report EPA-600/2-81-021, U. S. Environmental Protection Agency, Cincinnati, OH, February 1981; and
(c)R. C. Weast, ed., "CRC Handbook of Chemistry and Physics," 59th edition, CRC Press, Boca Raton, 1979.

TABLE 2. CHARACTERISTIC MASSES (M/Z) USED FOR QUANTIFYING THE TITLE III CLEAN AIR ACT AMENDMENT COMPOUNDS

Compound	CAS No.	Primary Ion	Secondary Ion
Methyl chloride (chloromethane); CH3Cl	74-87-3	50	52
Carbonyl sulfide; COS	463-S8-1	60	62
Vinyl chloride (chloroethene); C2H3Cl	7S-01-4	62	64
Diazomethane; CH2N2	334-88-3	42	41
Formaldehyde; CH2O	50-00-0	29	30
1,3-Butadiene; C4H6	106-99-0	39	54
Methyl bromide (bromomethane); CH3Br	74-83-9	94	96
Phosgene; CCl2O	75-44-5	63	65
Vinyl bromide (bromoethene); C2H3Br	593-60-2	106	108
Ethylene oxide; C2H4O	75-21-8	29	44
Ethyl chloride (chloroethane); C2H5Cl	75-00-3	64	66
Acetaldehyde (ethanal); C2H4O	75-07-0	44	29, 43
Vinylidene chloride (1,1-dichloroethylene); C2H2Cl2	75-35-4	61	96
Propylene oxide; C3H6O	75-56-9	58	57
Methyl iodide (iodomethane); CH3I	74-88-4	142	127
Methylene chloride; CH2Cl2	75-09-2	49	84, 86
Methyl isocyanate; C2H3NO	624-83-9	57	56
Allyl chloride (3-chloropropene); C3H5Cl	107-05-1	76	41, 78
Carbon disulfide; CS2	75-15-0	76	44, 78
Methyl tert-butyl ether; C5H12O	1634-04-4	73	41, 53
Propionaldehyde; C2H5CHO	123-38-6	58	29, 57
Ethylidene dichloride (1,1-dichloroethane); C2H4Cl2	75-34-3	63	65, 27
Chloroprene (2-chloro-1,3-butadiene); C4H5Cl	126-99-8	88	53, 90
Chloromethyl methyl ether; C2H5ClO	107-30-2	45	29, 49
Acrolein (2-propenal); C3H4O	107-02-8	56	55
1,2-Epoxybutane (1,2-butylene oxide); C4H8O	106-88-7	42	41, 72
Chloroform; CHCl3	67-66-3	83	85, 47
Ethyleneimine (aziridine); C2H5N	151-56-4	42	43
1,1-Dimethylhydrazine; C2H8N2	57-14-7	60	45, 59
Hexane; C6H14	110-54-3	57	41, 43
1,2-Propyleneimine (2-methylazindine); C3H7N	75-55-8	56	57, 42
Acrylonitrile (2-propenenitrile); C3H3N	107-13-1	53	52
Methyl chloroform (1,1,1 trichloroethane); C2H3Cl3	71-55-6	97	99, 61
Methanol; CH4O	67-56-1	31	29
Carbon tetrachloride; CCl4	56-23-5	117	119
Vinyl acetate; C4H6O2	108-05-4	43	86
Methyl ethyl ketone (2-butanone); C4H8O	78-93-3	43	72

TABLE 2. (continued)

Compound	CAS No.	Primary Ion	Secondary Ion
Benzene; C6H6	71-43-2	78	77,50
Acetonitrile (cyanomethane); C2H3N	75-05-8	41	40
Ethylene dichloride (1,2-dichloroethane); C2H4Cl2	107-06-2	62	64, 27
Triethylamine; C6H15N	121-44-8	86	58, 101
Methylhydrazine; CH6N2	60-34-4	46	31, 45
Propylene dichloride (1,2-dichloropropane); C3H6Cl2	78-87-5	63	41, 62
2,2,4-Trimethyl pentane; C8H18	540-84-1	57	41, 56
1,4-Dioxane (1,4 Diethylene oxide); C4H8O2	123-91-1	88	58
Bis(chloromethyl) ether; C2H4Cl2O	542-88-1	79	49, 81
Ethyl acrylate; C5H8O2	140-88-5	55	73
Methyl methacrylate; C5H8O2	80-62-6	41	69, 100
1,3-Dichloropropene; C3H4Cl2 (cis)	542-75-6	75	39, 77
Toluene; C7H8	108-88-3	91	92
Trichloethylene; C2HCl3	79-01-6	130	132, 95
1,1,2-Trichloroethane; C2H3Cl3	79-00-5	97	83, 61
Tetrachloroethylene; C2Cl4	127-18-4	166	164, 131
Epichlorohydrin (l-chloro-2,3-epoxy propane); C3H5ClO	106-89-8	57	49, 62
Ethylene dibromide (1,2-dibromoethane); C2H4Br2	106-93-4	107	109
N-Nitrso-N-methylurea; C2H5N3O2	684-93-5	60	44, 103
2-Nitropropane; C3H7NO2	79-46-9	43	41
Chlorobenzene; C6H5Cl	108-90-7	112	77, 114
Ethylbenzene; C8H10	100-41-4	91	106
Xylenes (isomer & mixtures); C8H10	1330-20-7	91	106
Styrene; C8H8	100-42-5	104	78, 103
p-Xylene; C8H10	106-42-3	91	106
m-Xylene; C8H10	108-38-3	91	106
Methyl isobutyl ketone (hexone); C6H12O	108-10-1	43	58, 100
Bromoform (tribromomethane); CHBr3	75-25-2	173	171, 175
1,1,2,2-Tetrachloroethane; C2H2Cl4	79-34-5	83	85
o-Xylene; C8H10	95-47-6	91	106
Dimethylcarbamyl chloride; C3H6ClNO	79-44-7	72	107
N-Nitrosodimethylamine; C2H6N2O	62-75-9	74	42
Beta-Propiolactone; C3H4O2	57-57-8	42	43
Cumene (isopropylbenzene); C9H12	98-82-8	105	120
Acrylic acid; C3H4O2	79-10-7	72	45, 55
N,N-Dimethylformamide; C3H7NO	68-12-2	73	42, 44
1,3-Propane sultone; C3H6O3S	1120-71-4	58	65, 122

TABLE 2. (continued)

Compound	CAS No.	Primary Ion	Secondary Ion
Acetophenone; C8H8O	98-86-2	105	77,120
Dimethyl sulfate; C2H6O4S	77-78-1	95	66,96
Benzyl chloride (a-chlorotoluene); C7H7Cl	100-44-7	91	126
1,2-Dibromo-3-chloropropane; C3H5Br2Cl	96-12-8	57	155, 157
Bis(2-Chloroethyl)ether; C4H8Cl2O	111-44-4	93	63, 95
Chloroacetic acid; C2H3ClO2	79-11-8	50	45, 60
Aniline (aminobenzene); C6H7N	62-53-3	93	66
1,4-Dichlorobenzene (p-); C6H4Cl2	106-46-7	146	148, 111
Ethyl carbamate (urethane); C3H7NO2	51-79-6	31	44, 62
Acrylamide; C3H5NO	79-06-1	44	55, 71
N,N-Dimethylaniline; C8H11N	121-69-7	120	77, 121
Hexachloroethane; C2Cl6	67-72-1	201	199, 203
Hexachlorobutadiene; C4Cl6	87-68-3	225	227, 223
Isophorone; C9H14O	78-59-1	82	138
N-Nitrosomorpholine; C4H8N2O2	59-89-2	56	86, 116
Styrene oxide; C8H8O	96-09-3	91	120
Diethyl sulfate; C4H10O4S	64-67-5	45	59, 139
Cresylic acid (cresol isomer mixture); C7H8O	1319-77-3		
o-Cresol; C7H8O	95-48-7	108	107
Catechol (o-hydroxyphenol); C6H6O2	120-80-9	110	64
Phenol; C6H6O	108-95-2	94	66
1,2,4-Trichlorobenzene; C6H3Cl3	120-82-1	180	182, 184
Nitrobenzene; C6H5NO2	98-95-3	77	51, 123

TABLE 3. REQUIRED BFB KEY IONS AND ION ABUNDANCE CRITERIA

Mass	Ion Abundance Criteria[1]
50	8.0 to 40.0 Percent of m/e 95
75	30.0 to 66.0 Percent of m/e 95
95	Base Peak, 100 Percent Relative Abundance
96	5.0 to 9.0 Percent of m/e 95 (See note)
173	Less than 2.0 Percent of m/e 174
174	50.0 to 120.0 Percent of m/e 95
175	4.0 to 9.0 Percent of m/e 174
176	93.0 to 101.0 Percent of m/e 174
177	5.0 to 9.0 Percent of m/e 176

[1]All ion abundances must be normalized to m/z 95, the nominal base peak, even though the ion abundance of m/z 174 may be up to 120 percent that of m/z 95.

TABLE 4. METHOD DETECTION LIMITS (MDL)[1]

TO-14A List	Lab #1, SCAN	Lab #2, SIM
Benzene	0.34	0.29
Benzyl Chloride	--	--
Carbon tetrachloride	0.42	0.15
Chlorobenzene	0.34	0.02
Chloroform	0.25	0.07
1,3-Dichlorobenzene	0.36	0.07
1,2-Dibromoethane	--	0.05
1,4-Dichlorobenzene	0.70	0.12
1,2-Dichlorobenzene	0.44	--
1,1-Dichloroethane	0.27	0.05
1,2-Dichloroethane	0.24	--
1,1-Dichloroethene	--	0.22
cis-1,2-Dichloroethene	--	0.06
Methylene chloride	1.38	0.84
1,2-Dichloropropane	0.21	--
cis-1,3-Dichloropropene	0.36	--
trans-1,3-Dichloropropene	0.22	--
Ethylbenzene	0.27	0.05
Chloroethane	0.19	--
Trichlorofluoromethane	--	--
1,1,2-Trichloro-1,2,2-trifluoroethane		--
1,2-Dichloro-1,1,2,2-tetrafluoroethane	--	--
Dichlorodifluoromethane	--	--
Hexachlorobutadiene	--	--
Bromomethane	0.53	--
Chloromethane	0.40	--
Styrene	1.64	0.06
1,1,2,2-Tetrachloroethane	0.28	0.09
Tetrachloroethene	0.75	0.10
Toluene	0.99	0.20
1,2,4-Trichlorobenzene	--	--
1,1,1-Trichloroethane	0.62	0.21
1,1,2-Trichloroethane	0.50	--
Trichloroethene	0.45	0.07
1,2,4-Trimethylbenzene	--	--
1,3,5-Trimethylbenzene	--	--
Vinyl Chloride	0.33	0.48
m,p-Xylene	0.76	0.08
o-Xylene	0.57	0.28

[1]Method Detection Limits (MDLs) are defined as the product of the standard deviation of seven replicate analyses and the student's "t" test value for 99% confidence. For Lab #2, the MDLs represent an average over four studies. MDLs are for MS/SCAN for Lab #1 and for MS/SIM for Lab #2.

TABLE 5. SUMMARY OF EPA DATA ON REPLICATE PRECISION (RP) FROM EPA NETWORK OPERATIONS[1]

Monitoring Compound Identification	EPA's Urban Air Toxics Monitoring Program (UATMP)			EPA's Toxics Air Monitoring Stations (TAMS)		
	%RP	#	ppbv	%RP	#	ppbv
Dichlorodifluoromethane	--		--	13.9	47	0.9
Methylene chloride	16.3	07	4.3	19.4	47	0.6
1,2-Dichloroethane	36.2	31	1.6	--	--	--
1,1,1-Trichloroethane	14.1	44	1.0	10.6	47	2.0
Benzene	12.3	56	1.6	4.4	47	1.5
Trichloroethene	12.8	08	1.3	--	--	--
Toluene	14.7	76	3.1	3.4	47	3.1
Tetrachloroethene	36.2	12	0.8	--	--	--
Chlorobenzene	20.3	21	0.9	--	--	--
Ethylbenzene	14.6	32	0.7	5.4	47	0.5
m-Xylene	14.7	75	4.0	5.3	47	1.5
Styrene	22.8	59[2]	1.1	8.7	47	0.2[2]
o-Xylene	--		--	6.0	47	0.5
p-Xylene	--					
1,3-Dichlorobenzene	49.1	06	0.6	--	--	--
1,4-Dichlorobenzene	14.7	14	6.5	--	--	--

[1]Denotes the number of replicate or duplicate analysis used to generate the statistic. The replicate precision is defined as the mean ratio of absolute difference to the average value.
[2]Styrene and o-xylene coelute from the GC column used in UATMP. For the TAMS entries, both values were below detection limits for 18 of 47 replicates and were not included in the calculation.

TABLE 6. AUDIT ACCURACY (AA) VALUES[1] FOR SELECTED COMPENDIUM METHOD TO-14A COMPOUNDS

Selected Compounds From TO-14A List	FY-88 TAMS AA(%), N=30	FY-88 UATMP AA(%), N=3
Vinyl chloride	4.6	17.9
Bromomethane	--	6.4
Trichlorofluoromethane	6.4	--
Methylene chloride	8.6	31.4
Chloroform	--	4.2
1,2-Dichloroethane	6.8	11.4
1,1,1-Trichloroethane	18.6	11.3
Benzene	10.3	10.1
Carbon tetrachloride	12.4	9.4
1,2-Dichloropropane	--	6.2
Trichloroethene	8.8	5.2
Toluene	8.3	12.5
Tetrachloroethene	6.2	--
Chlorobenzene	10.5	11.7
Ethylbenzene	12.4	12.4
o-Xylene	16.2	21.2

[1]Audit accuracy is defined as the relative difference between the audit measurement result and its nominal value divided by the nominal value. N denotes the number of audits averaged to obtain the audit accuracy value. Information is not available for other TO-14A compounds because they were not present in the audit materials.

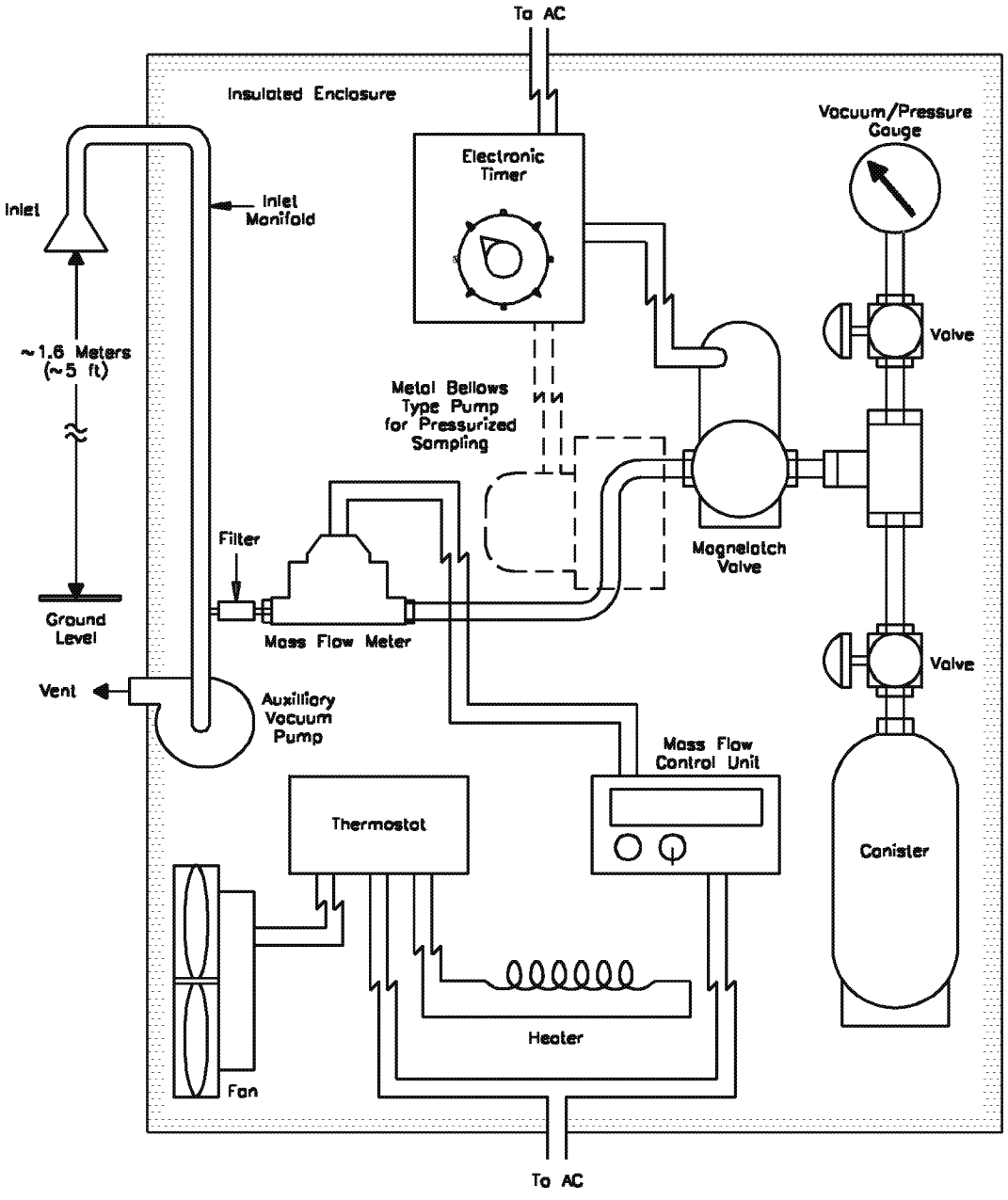
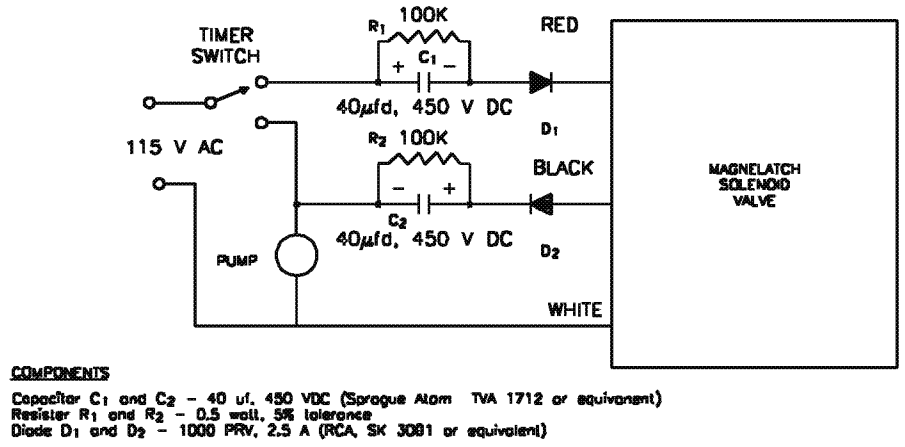


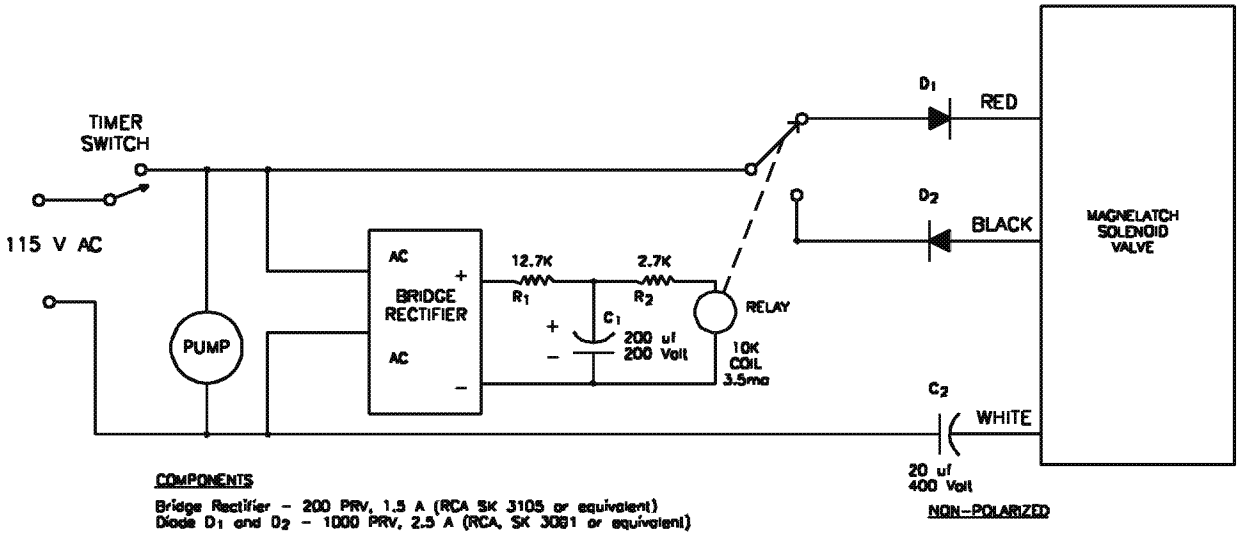
Figure 1. Sampler configuration for subatmospheric pressure or pressurized canister sampling.



COMPONENTS

Capacitor C_1 and C_2 – 40 uf, 450 VDC (Sprague Atom TVA 1712 or equivanent)
Resister R_1 and R_2 – 0.5 watt, 5% tolerance
Diode D_1 and D_2 – 1000 PRV, 2.5 A (RCA, SK 3081 or equivalent)

(a). Simple Circuit for Operating Magnelatch Valve



COMPONENTS

Bridge Rectifier – 200 PRV, 1.5 A (RCA SK 3105 or equivalent)
Diode D_1 and D_2 – 1000 PRV, 2.5 A (RCA, SK 3081 or equivalent)
Capacitor C_1 – 200 uf, 250 VDC (Sprague Atom TVA 1528 or equivalent)
Capacitor C_2 – 20 uf, 400 VDC Non-Polarized (Sprague Atom TVAN 1652 or equivalent)
Relay – 10,000 ohm coil, 3.5 ma (AMF Potter and Brumfield, KCP 5, or equivalent)
Resister R_1 and R_2 – 0.5 watt, 5% tolerance

(b). Improved Circuit Designed to Handle Power Interruptions

Figure 2. Electrical pulse circuits for driving Skinner magnelatch solenoid valve with mechanical timer.

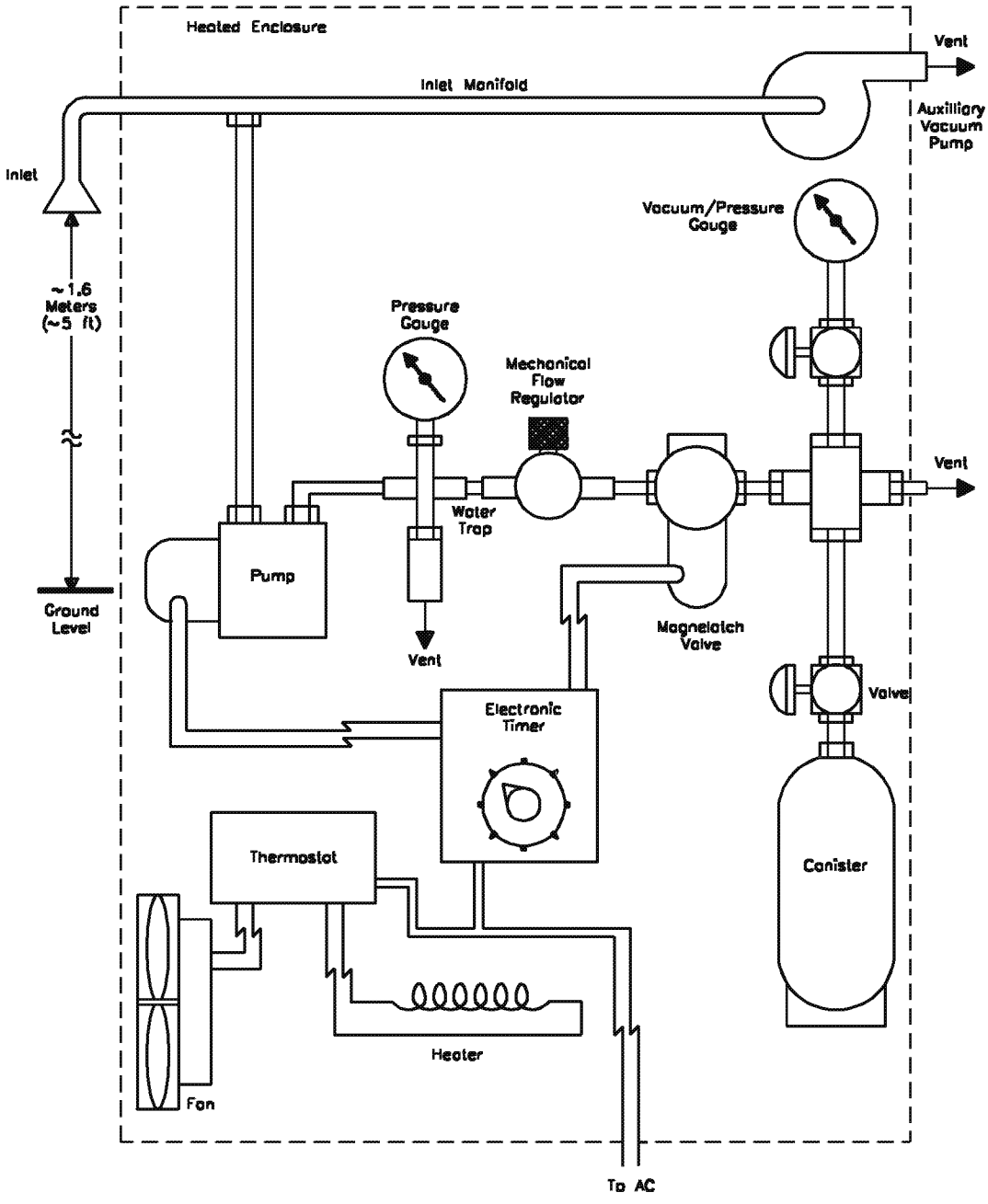


Figure 3. Alternative sampler configuration for pressurized canister sampling.

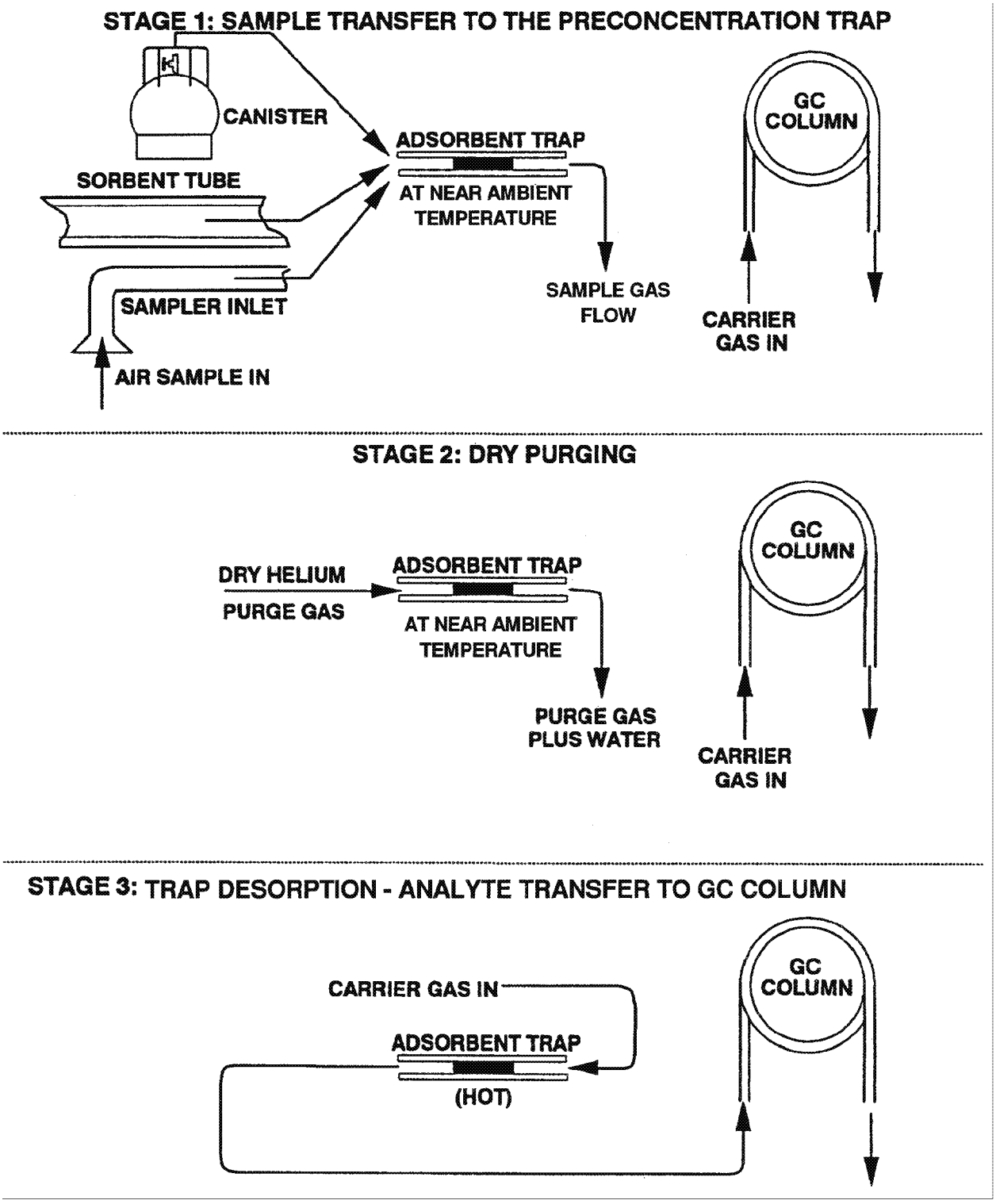


Figure 4. Illustration of three stages of dry purging of adsorbent trap.

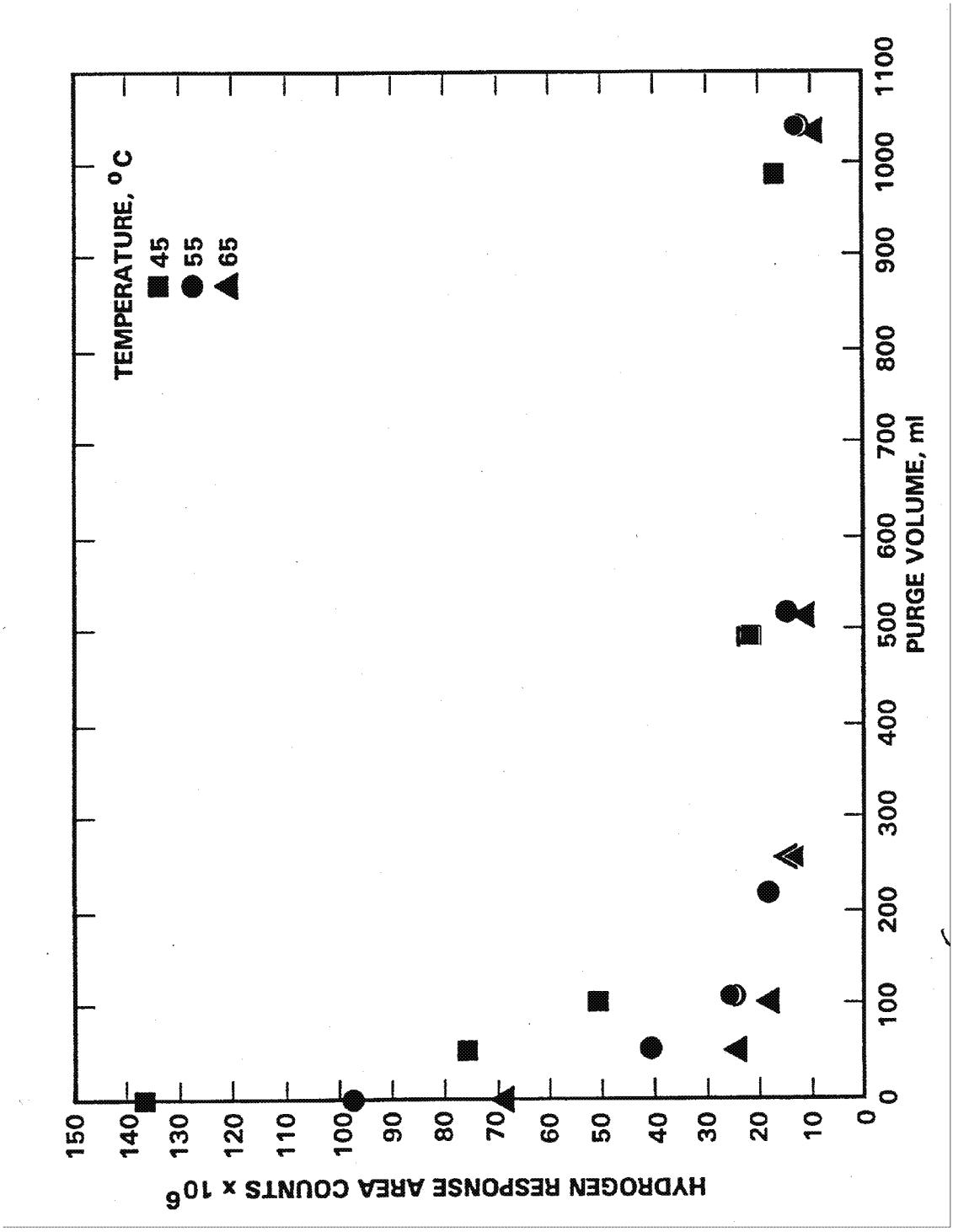


Figure 5. Residual water vapor on VOC concentrator vs. dry He purge volume.

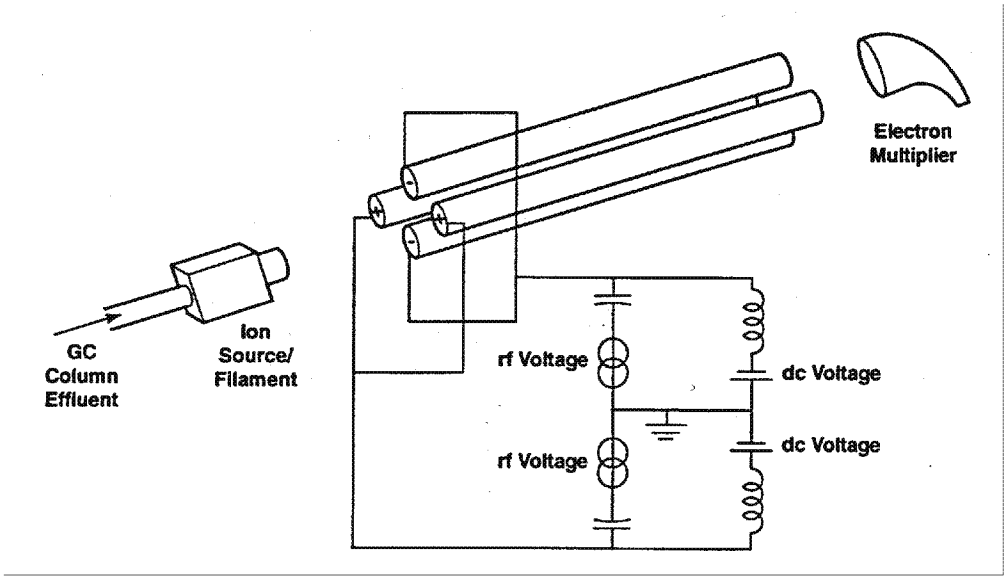


Figure 6. Simplified diagram of a quadrupole mass spectrometer.

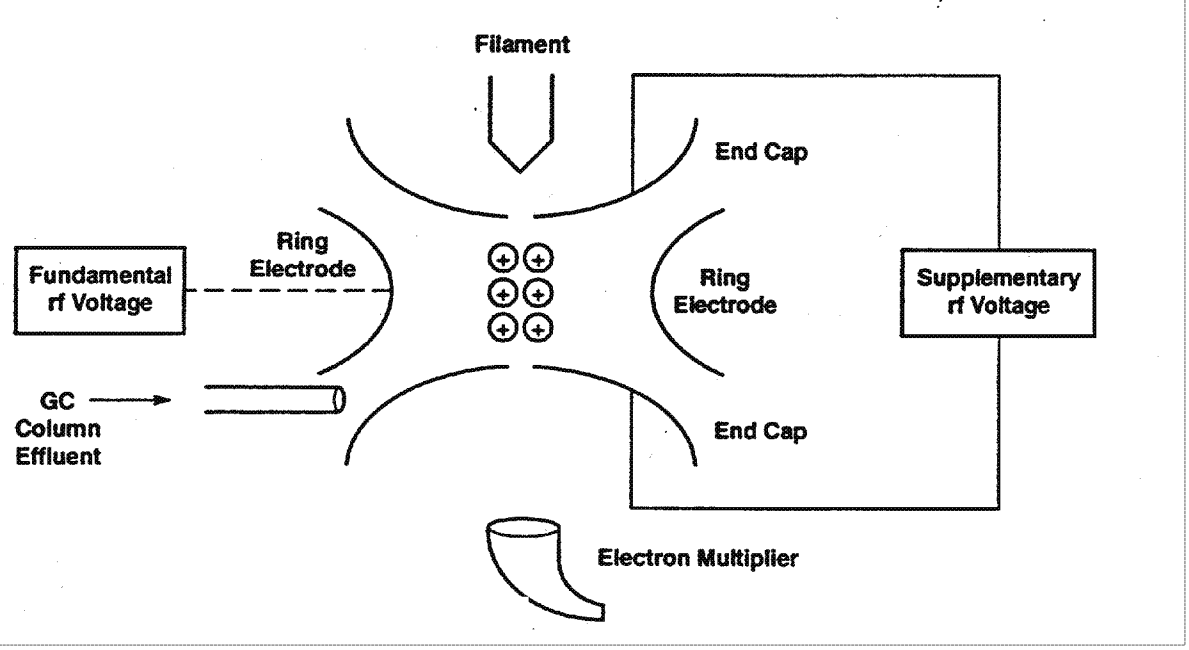


Figure 7. Simplified diagram of an ion trap mass spectrometer.

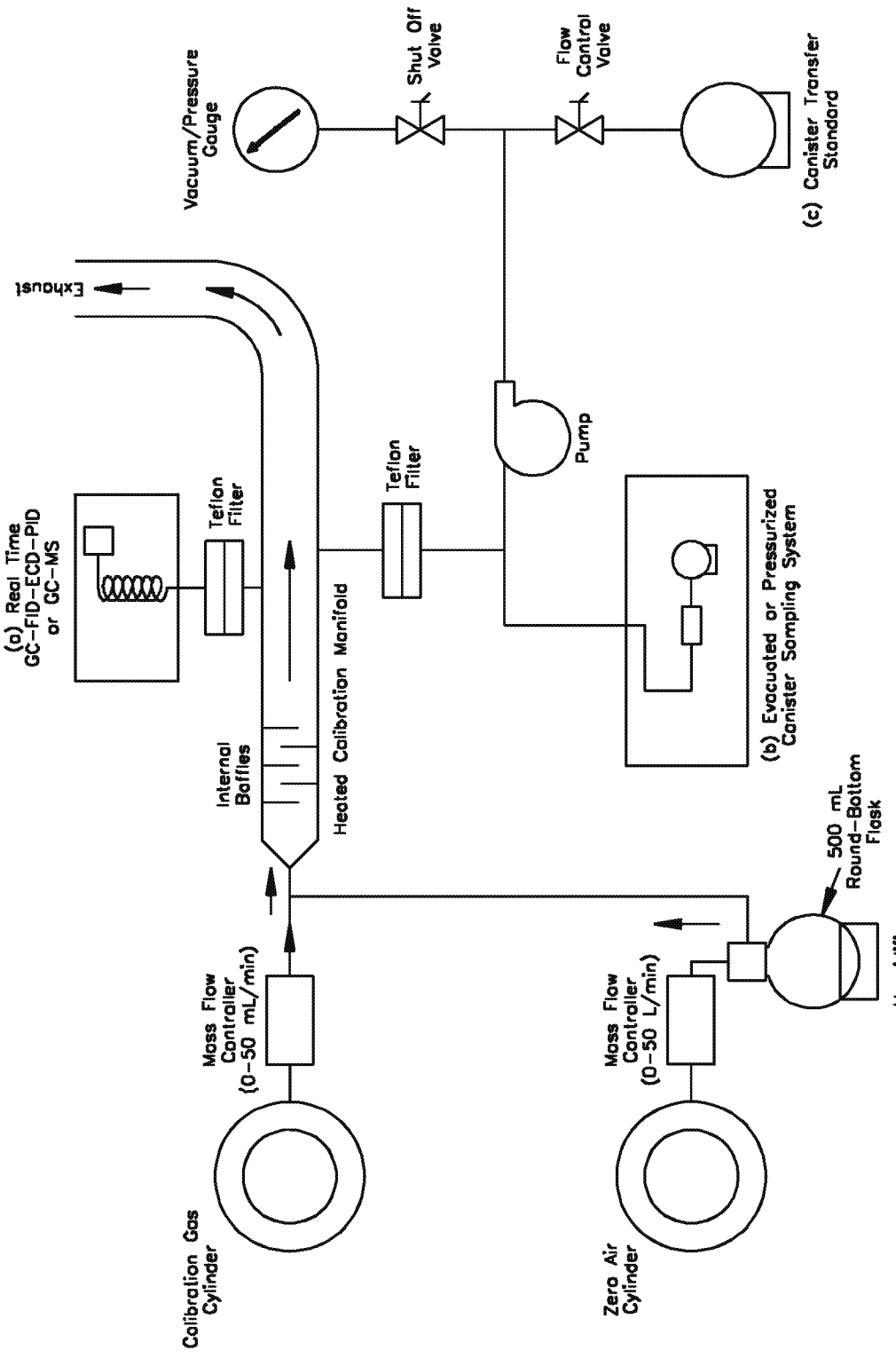


Figure 8. Schematic diagram of calibration system and manifold for (a) analytical system calibration, (b) testing canister sampling system and (c) preparing canister transfer standards.

COMPENDIUM METHOD TO-15
CANISTER SAMPLING FIELD TEST DATA SHEET

A.GENERAL INFORMATION

SITE LOCATION: _____
SITE ADDRESS: _____
_____
SAMPLING DATE: _____

SHIPPING DATE: _____
CANISTER SERIAL NO.: _____
SAMPLER ID: _____
OPERATOR: _____
CANISTER LEAK
CHECK DATE: _____

B. SAMPLING INFORMATION

	TEMPERATURE				PRESSURE	
	INTERIOR	AMBIENT	MAXIMUM	MINIMUM	CANISTER PRESSURE	
START						
STOP						

	SAMPLING TIMES		FLOW RATES		
	LOCAL TIME	ELAPSED TIME METER READING	MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT
START					
STOP					

SAMPLING SYSTEM CERTIFICATION DATE: _____
QUARTERLY RECERTIFICATION DATE: _____

C. LABORATORY INFORMATION

DATA RECEIVED: _____
RECEIVED BY: _____
INITIAL PRESSURE: _____
FINAL PRESSURE: _____
DILUTION FACTOR: _____
ANALYSIS
GC-FID-ECD DATE: _____
GC-MSD-SCAN DATE: _____
GC-MSD-SIM DATE: _____
RESULTS*: _____
_____
GC-FID-ECD: _____
GC-MSD-SCAN: _____
GC-MSD-SIM: _____

_____
SIGNATURE/TITLE

Figure 9. Canister sampling field test data sheet (FTDS).

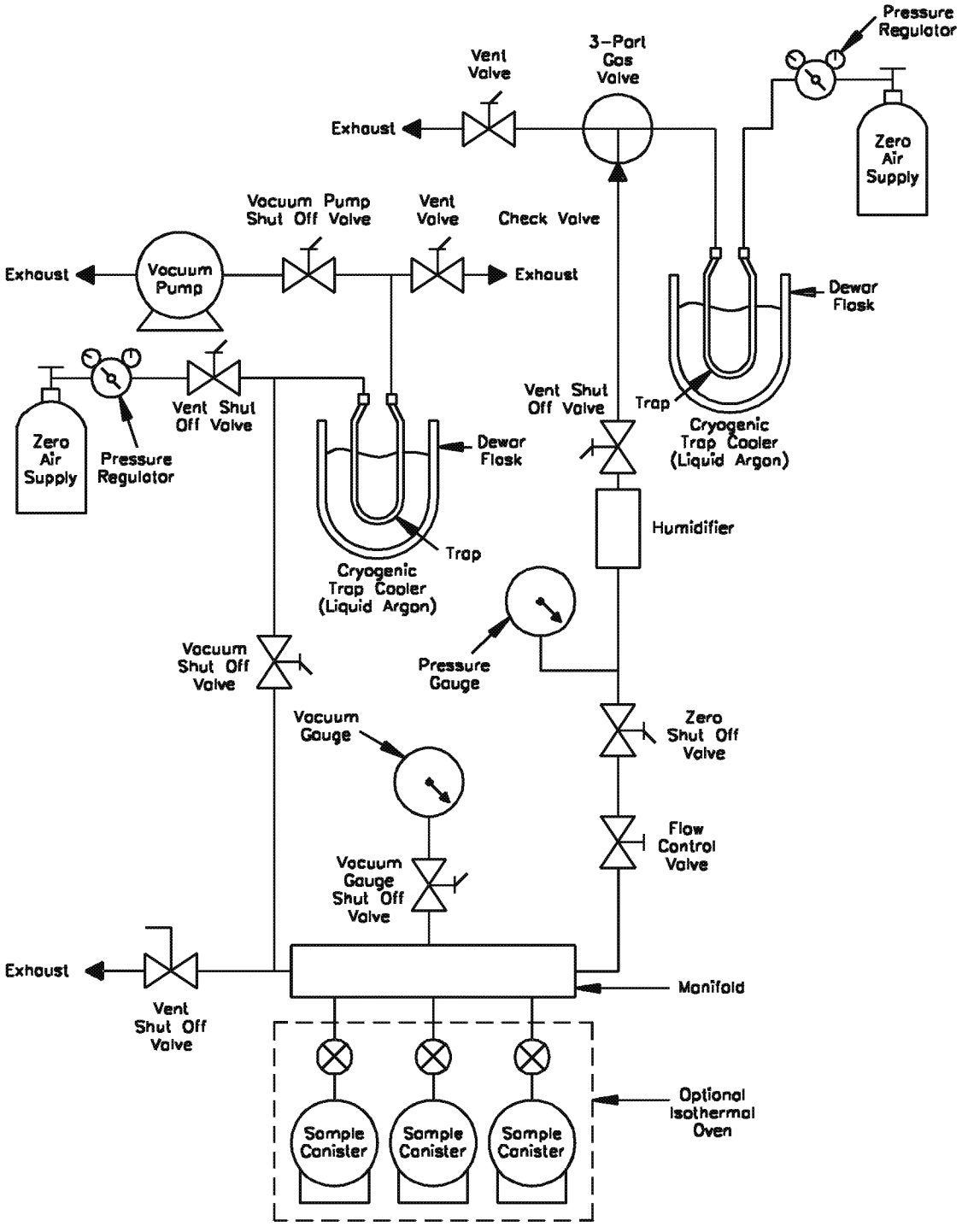


Figure 10. Canister cleaning system.

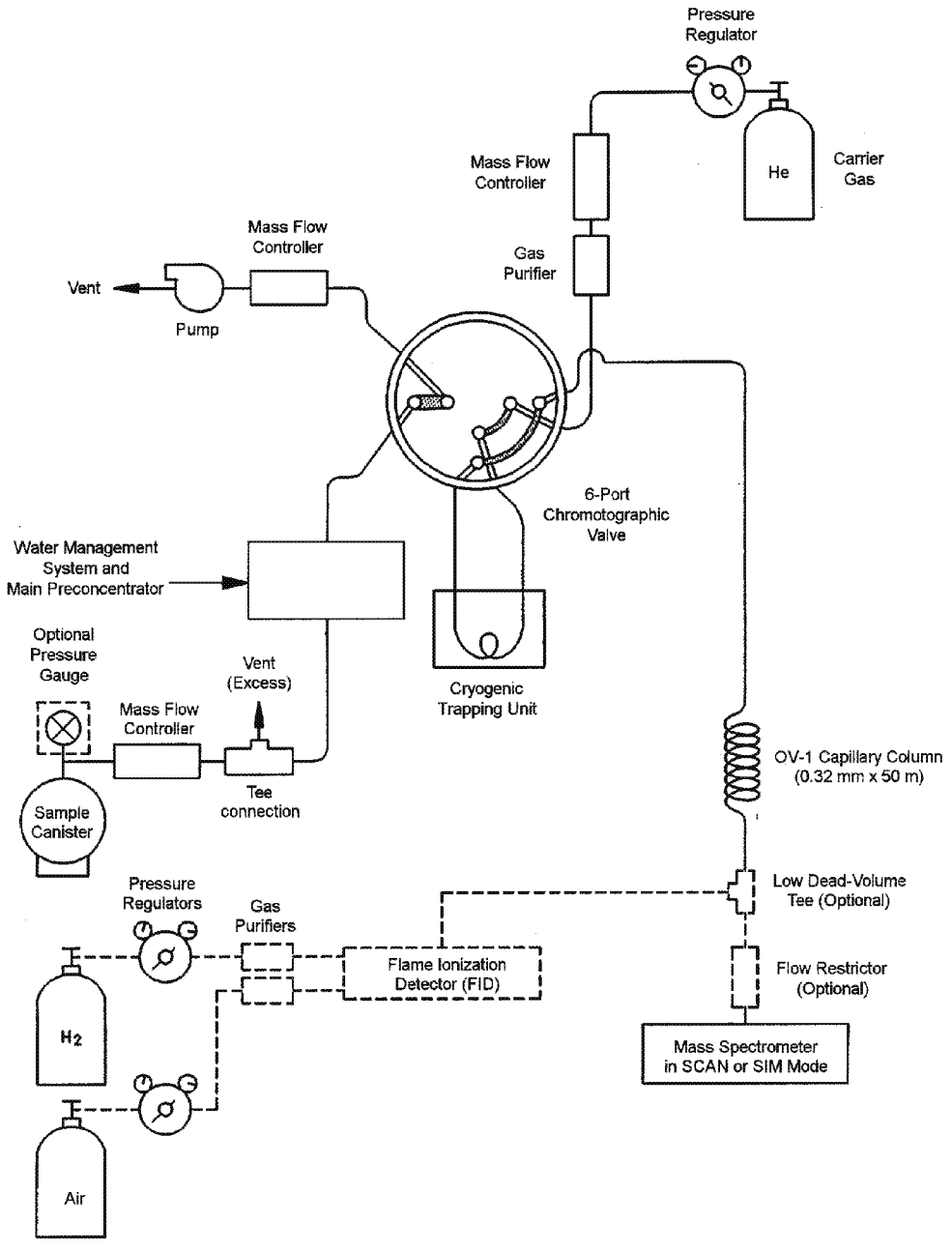
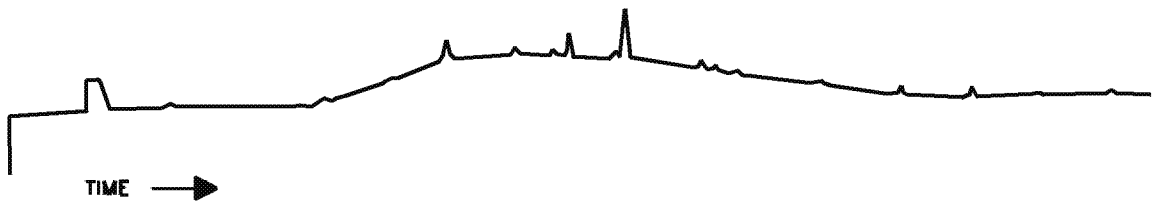
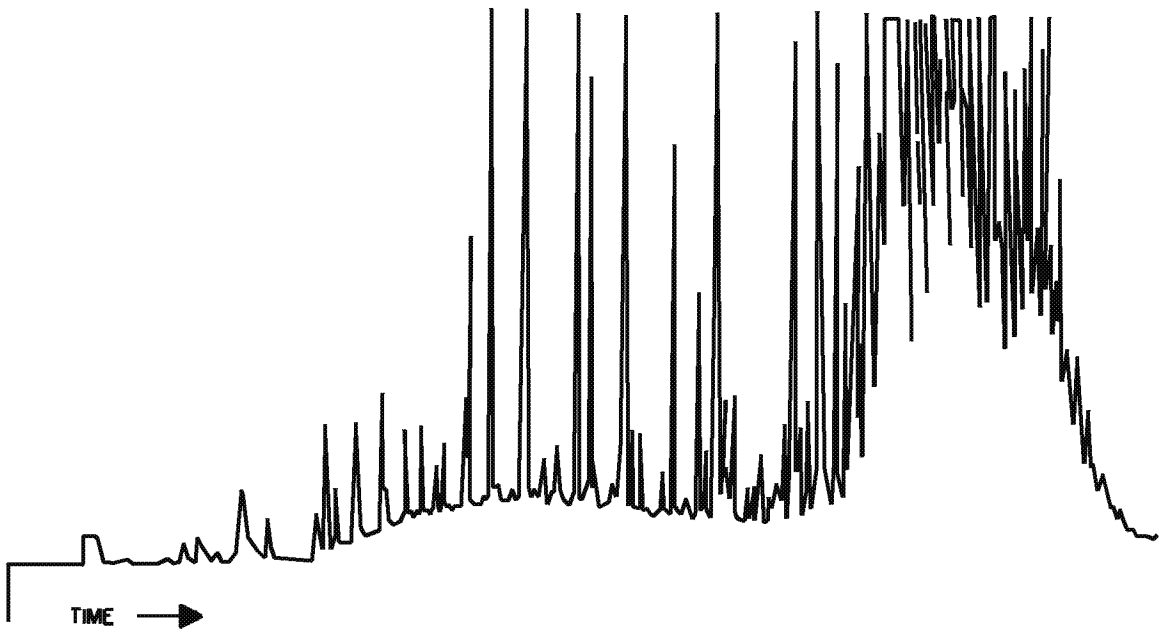


Figure 11. Canister analysis utilizing GC/MS/SCAN/SIM analytical system with optional flame ionization detector with 6-port chromatographic valve in the sample desorption mode.
[Alternative analytical system illustrated in Figure 16.]



(a). Certified Sampler



(b). Contaminated Sampler

Figure 12. Example of humid zero air test results for a clean sample canister (a) and a contaminated sample canister (b).

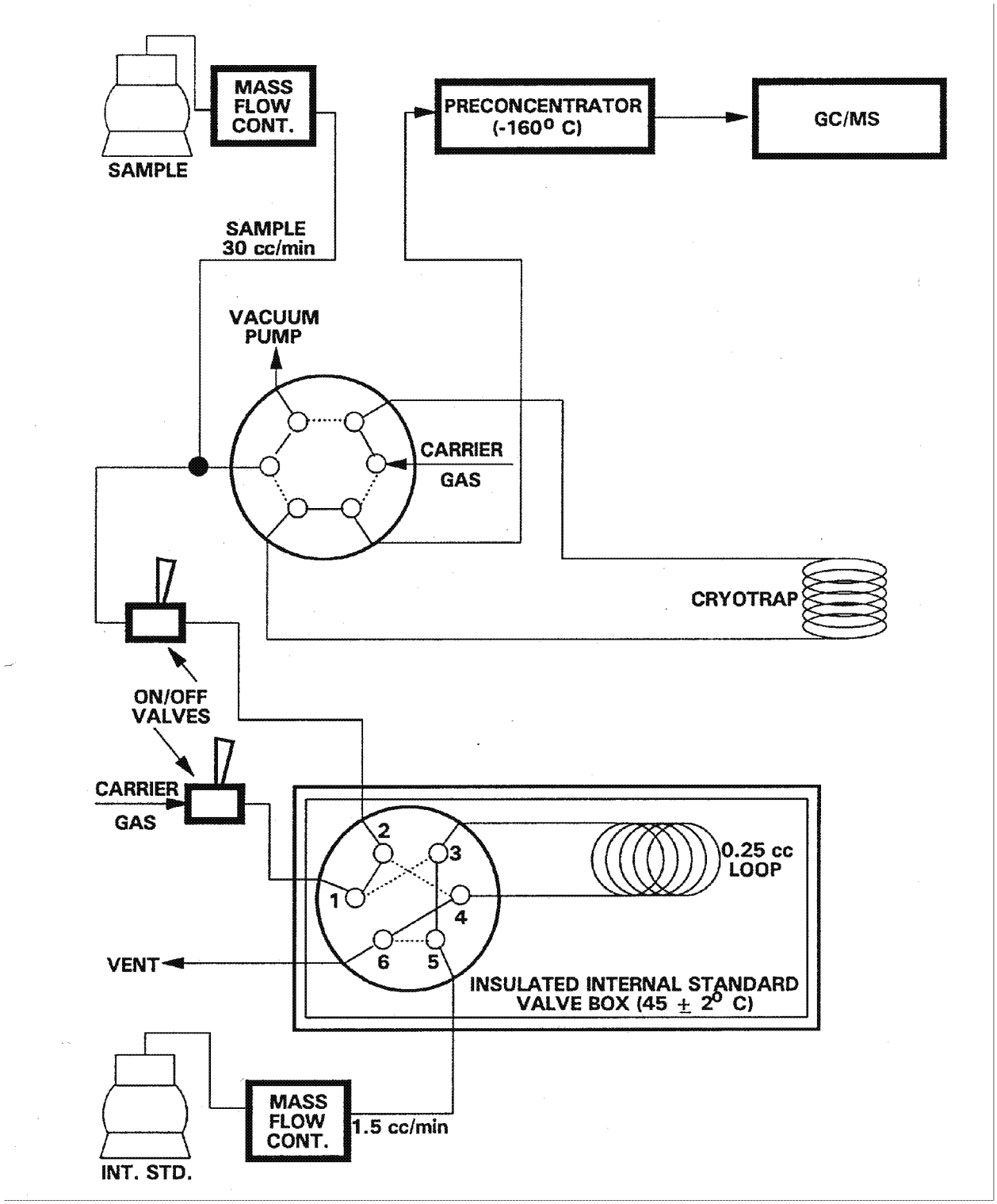


Figure 13. Diagram of design for internal standard addition.

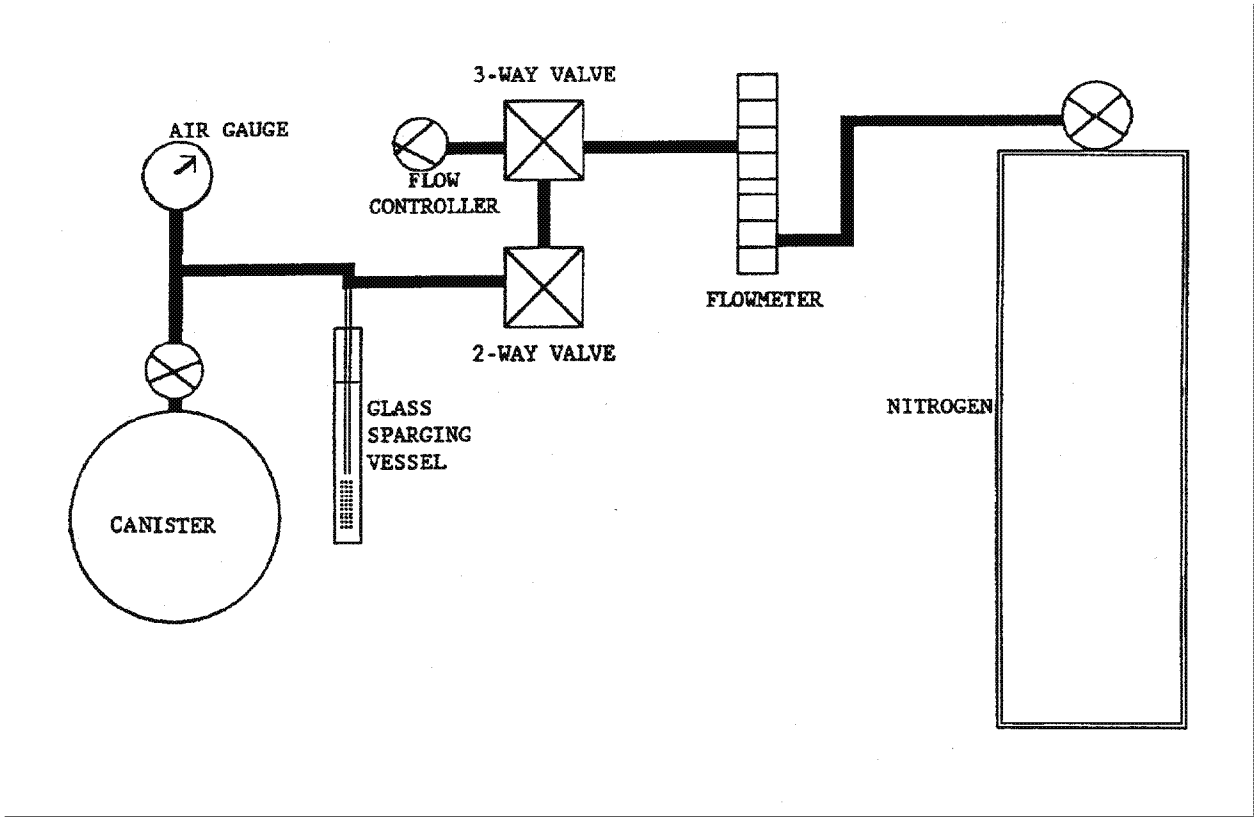


Figure 14. Water method of standard preparation in canisters.

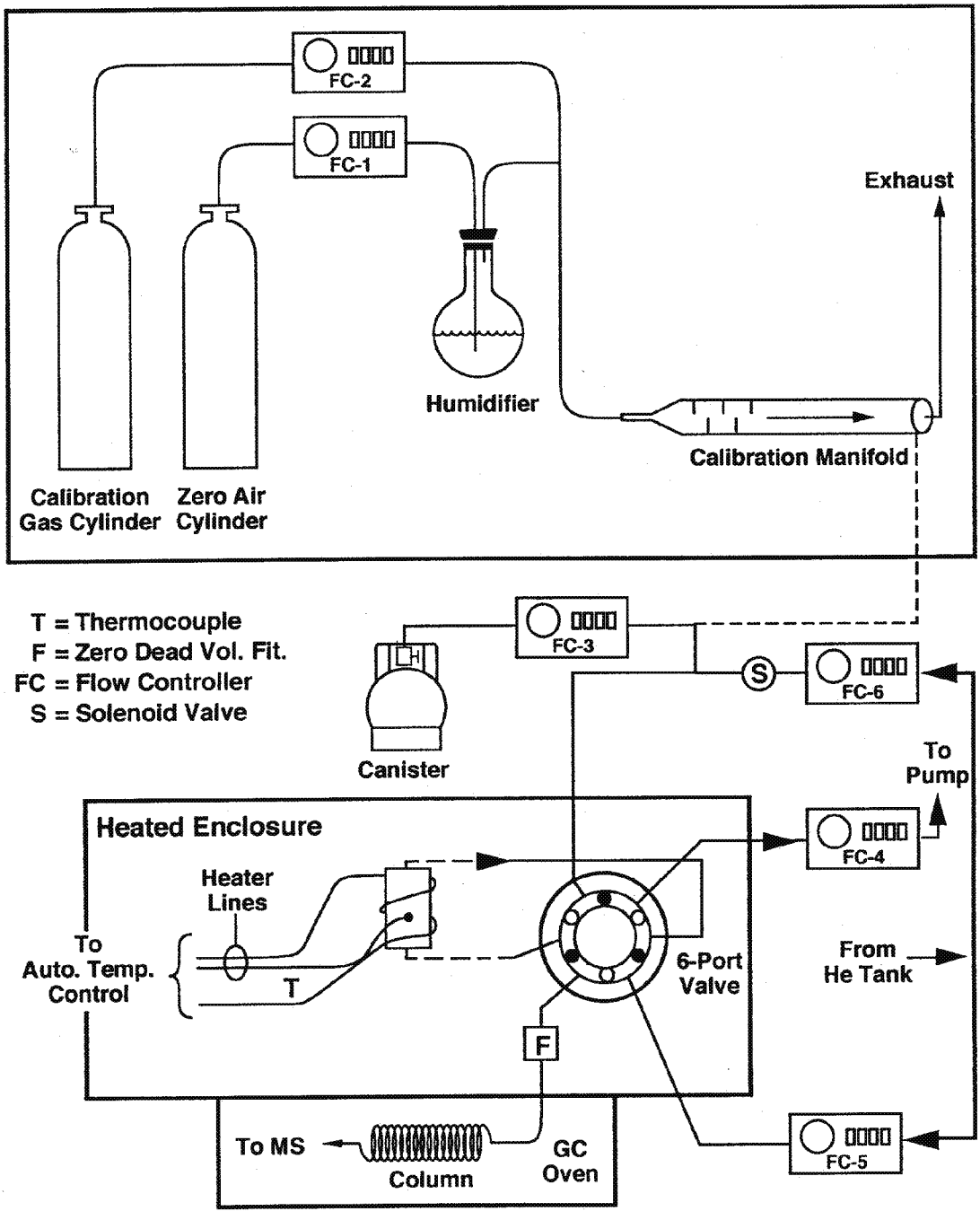


Figure 15. Diagram of the GC/MS analytical system.

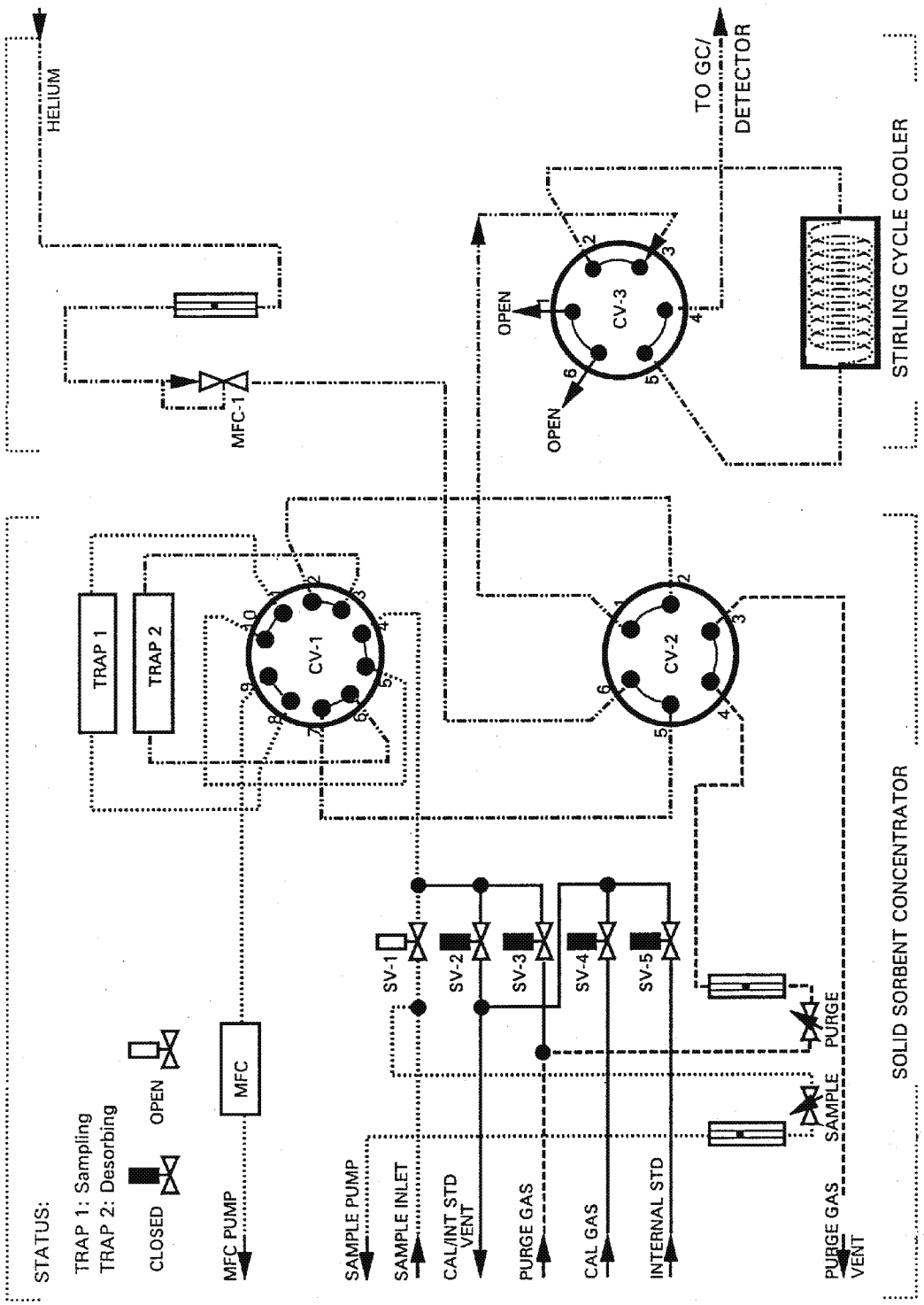


Figure 16. Sample flow diagram of a commercially available concentrator showing the combination of multisorbent tube and cooler (Trap 1 sampling; Trap 2 desorbing).

Roberts, Timothy-P

From: January, Elizabeth
Sent: Tuesday, April 12, 2022 9:02 AM
To: Roberts, Timothy-P
Cc: Laursen, Myranda
Subject: FW: Lake County Environmental Works Ticket

For your records. Looks like this was likely a system issue, maybe not initially, but it definitely became one due to the draft record not showing up for them to take action on. I believe this was one I recommended letting in, and this further supports that decision.

Elizabeth January
Acting Senior Associate Director for Grants Competition
Office of Grants and Debarment
January.elizabeth@epa.gov
202-564-1584
she/her

From: Brunecz, Michelle <Brunecz.Michelle@epa.gov>
Sent: Tuesday, April 12, 2022 8:42 AM
To: January, Elizabeth <January.Elizabeth@epa.gov>
Subject: FW: Lake County Environmental Works Ticket

SAM/IAE Request for Assistance / IAEREQ-4733 IN PROGRESS

Request Entity Assistance with Registration - Previously submitted I GSAFSD5884956 and Tanaka ticket # INC-GSAFSD5891361

View issue · Add comment

1 comment

derek wilson on 04/11/2022 08:20

[~marci.eaton] - IAEREQ-4691 and this one appears to be surrounding the same scenario. The problem them to get hung at the error message that stated "There is an issue with the status of your entity regis now be resolved. They have started the registration process from the 'ID Assigned' version and because find a match they now have a ticket in with EVS to validate the LBN & Address that was entered. That ti the INC-GSAFSD5929847 ticket if needed.

The cause of the "There is an issue with the status of your entity registration" error message had somet 'draft' record that was showing up in the database but wasn't showing up on the front-end to allow the on.

From: Brunecz, Michelle
Sent: Friday, April 8, 2022 12:03 PM
To: January, Elizabeth <January.Elizabeth@epa.gov>
Subject: RE: Lake County Environmental Works Ticket

SAM/IAE Request for Assistance / IAEREQ-4733 IN

Request Entity Assistance with Reg
Previously submitted INC-GSAFSD
Tanaka ticket # INC-GSAFSD58913

View issue · Add comment

1 update

Changes by **marci eaton** on 04/08/2022 11:30

User Access to Issue: derek wilson, marci eaton, m

1 comment

From: January, Elizabeth <January.Elizabeth@epa.gov>
Sent: Friday, April 8, 2022 7:30 AM
To: Brunecz, Michelle <Brunecz.Michelle@epa.gov>; Laursen, Myranda <laursen.myranda@epa.gov>
Subject: RE: Lake County Environmental Works Ticket

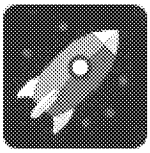
Thank you Michelle!

Elizabeth January
Acting Senior Associate Director for Grants Competition
Office of Grants and Debarment
January.elizabeth@epa.gov
202-564-1584
she/her

From: Brunecz, Michelle <Brunecz.Michelle@epa.gov>
Sent: Thursday, April 7, 2022 5:23 PM
To: Laursen, Myranda <laursen.myranda@epa.gov>

Cc: January, Elizabeth <January.Elizabeth@epa.gov>
Subject: RE: Lake County Environmental Works Ticket

Escalated.



SAM/IAE Request for Assistance / IAEREQ-4733

Request Entity Assistance with Regis ticket # INC-GSAFSD5891361

Edit | Add comment | Assign | More | Start prog

Details

Type:	Request Assistance (SAM / IAE)
Priority:	High
Labels:	None
Requestor:	Michelle Brunecz, 919-541-0736, brunecz
Requesting Agency:	EPA
Systems:	SAM.gov (Entity Registration/Reporting)
Description of Assistance Requested:	Lake County Environmental Works is a successfully obtained a DUNS & UEI - them in SAM.gov as "ID Assigned". When attempting to continue the reg is an issue with the status of your enti have contacted the FSD via INC-GSAF tickets have been escalated to Tier 2. I submitter is now out of the country, a notified that something was done anc Per e-mail update 2, it appears a 3rd t

From: Laursen, Myranda <laursen.myranda@epa.gov>
Sent: Thursday, April 7, 2022 3:32 PM
To: Brunecz, Michelle <Brunecz.Michelle@epa.gov>
Cc: January, Elizabeth <January.Elizabeth@epa.gov>
Subject: Lake County Environmental Works Ticket

Good Afternoon Michelle,

Attached is an email transmission between us and our colleagues in OAR who we are trying to work with regarding their grant applicants. We spoke last week about needing the case notes and you asked back for their tickets. In the attached email is two attachments that should fulfill your asks. If possible, we would appreciate it SAM can elevate the ticket, as it has been tier 2 since March 24th and there still has yet to be a resolution.

Please let me know if you need anything else from us on our end.

Best -

Myranda Laursen
Program Analyst
(she/they)
U.S. Environmental Protection Agency
Office of Grants and Debarment
Email: laursen.myranda@epa.gov
Phone: 202-564-8909

College of Lake County

Southlake Campus

1120 South Milwaukee Avenue
Vernon Hills, Illinois 60061

www.clcillinois.edu/slc

College Lake County

AHMAD ALI AUDI, PhD

aaaudi@clcillinois.edu

CHEMISTRY FACULTY

Phone: (847) 543 - 6537

Mar 25, 2022

TO: USEPA, Enhanced Air Quality Monitoring for Communities

RE: Lake County Environmental Works (LCEW) "Survey of Ethylene Oxide in Lake County, Illinois Using Best Testing Practices" Project

I am writing this letter in support of Lake County Environmental Works (LCEW) "Survey of Ethylene Oxide in Lake County, Illinois Using Best Testing Practices" Project's application to test the air quality in the indicated region of lake county.

I happen to teach a "chemistry in context" course in the local college. One of the chapters we cover is Air Quality. Some of my previous students coming from Gurnee and Waukegan wrote papers about the residents' concerns of the EtO emissions. Having a station measuring the air quality in this local area and learning more about the potential impact of EtO on health will have a good impact on alleviating the concerns and assuring the students and the community.

Having this station in our locality, I see an additional opportunity for our students to further hands-on learning that complement the different experiments the students do in our classes. Besides being a chemistry faculty member in the local College of Lake County will help increase our community outreach to local issues of concern. Coming from an analytical chemistry background and having used advanced measurements instrumentations, I see a good opportunity to support this project.

If you have any concerns or questions that will further help LCEW's application get accepted, please do not hesitate to contact me.

Sincerely,

A L AUDI

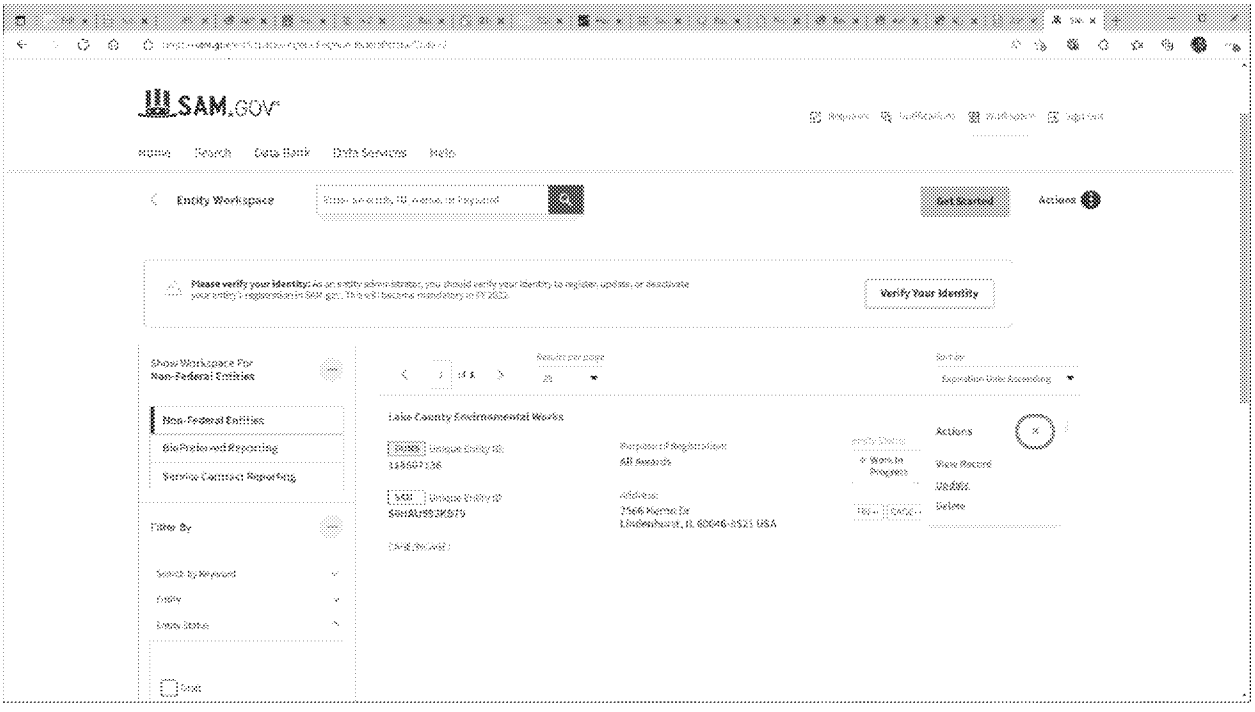
Ahmad

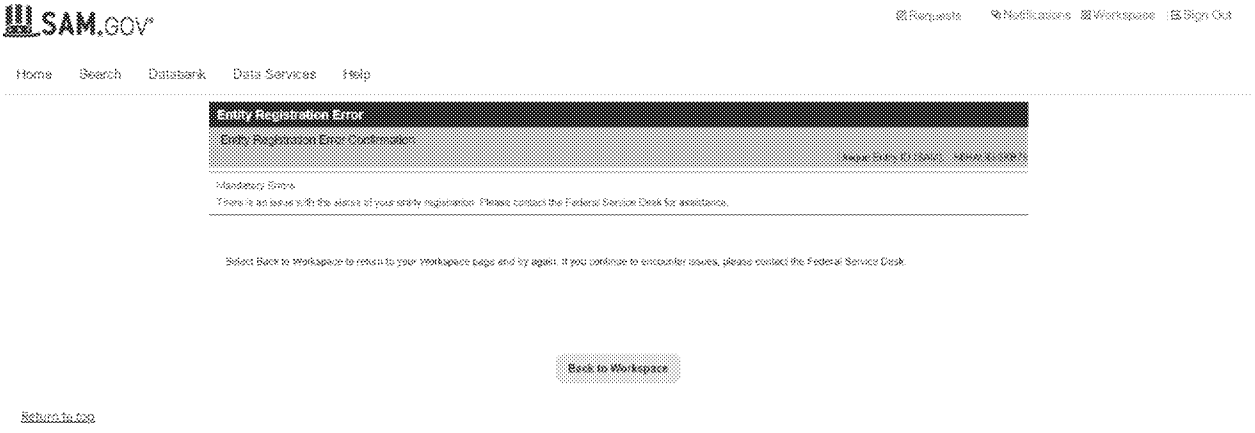
Room V208, 1120 S. Milwaukee Ave, Vernon Hills, IL 60061-3195

Transmission difficulties:

Lake County Environmental Works directors, John Aldrin was getting an error from sam.gov website while trying to register the entity DUNS ID 118607136 and SAM ID S6HAU593KB79.

The error read: "*There is an issue with the status of your entity registration. Please contact the Federal Service Desk.*" (Refer to attached screenshots below):





Dr. Aldrin called the Federal Service Desk (FSD) to resolve the issue. FSD could not resolve the issue but elevated it to Tier 2. Ticket # INC-GSAFSD5884956 was generated. (Refer to screenshot below):

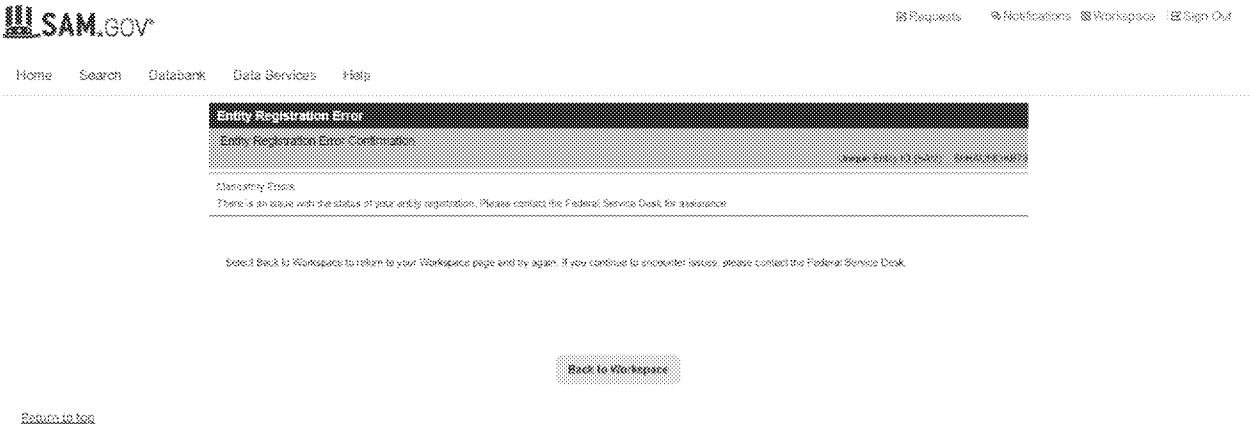
INC-GSAFSD5884956 - I need to update Lake County Environmental Works Toggle Actions DUNS Unique Entity ID: 118607136 SAM Unique Entity ID: S6HAU593KB79, but can't access it online.

An incident has been opened on your behalf.

You can view all the details of the incident by following the link below:

After several phone calls with FSD, unable to continue the registration process any further in sam.gov, Dr. Aldrin added Teuta Tanaka, another director of Lake County Environmental Works, to the entity in the system.

Ms. Tanaka attempted to register the entity using her account. However, the same error message appeared:



Ms. Tanaka called the FSD again and a new ticket was opened:

INC-GSAFSD5891361 - role

An incident has been opened on your behalf.

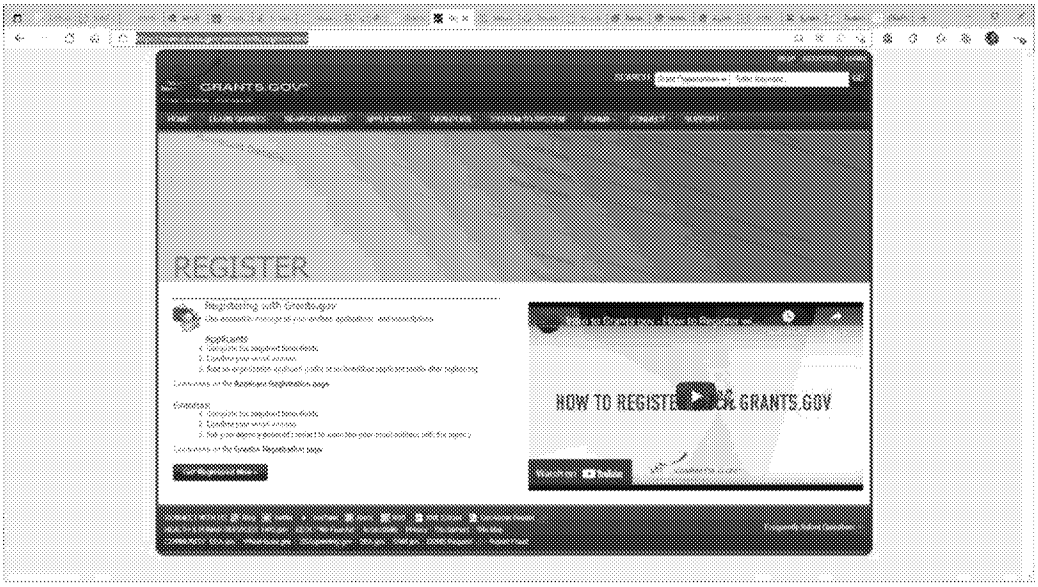
You can view all the details of the incident by following the link below:

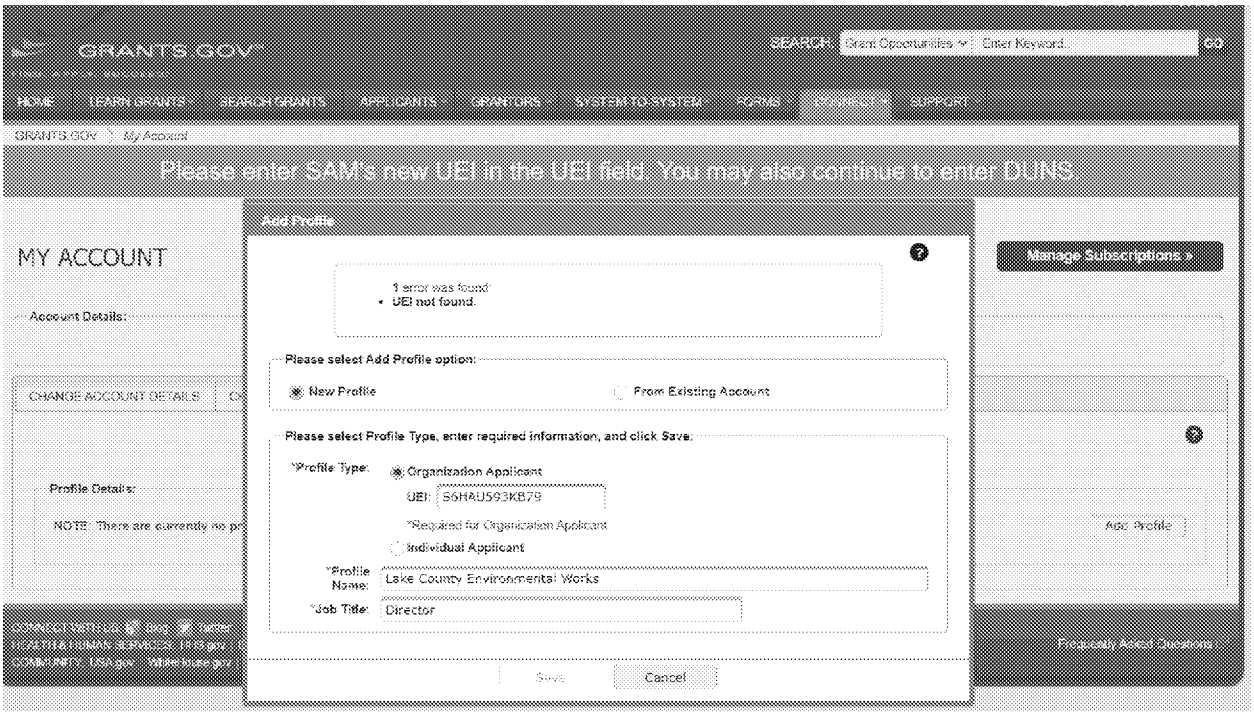
Take me to the incident

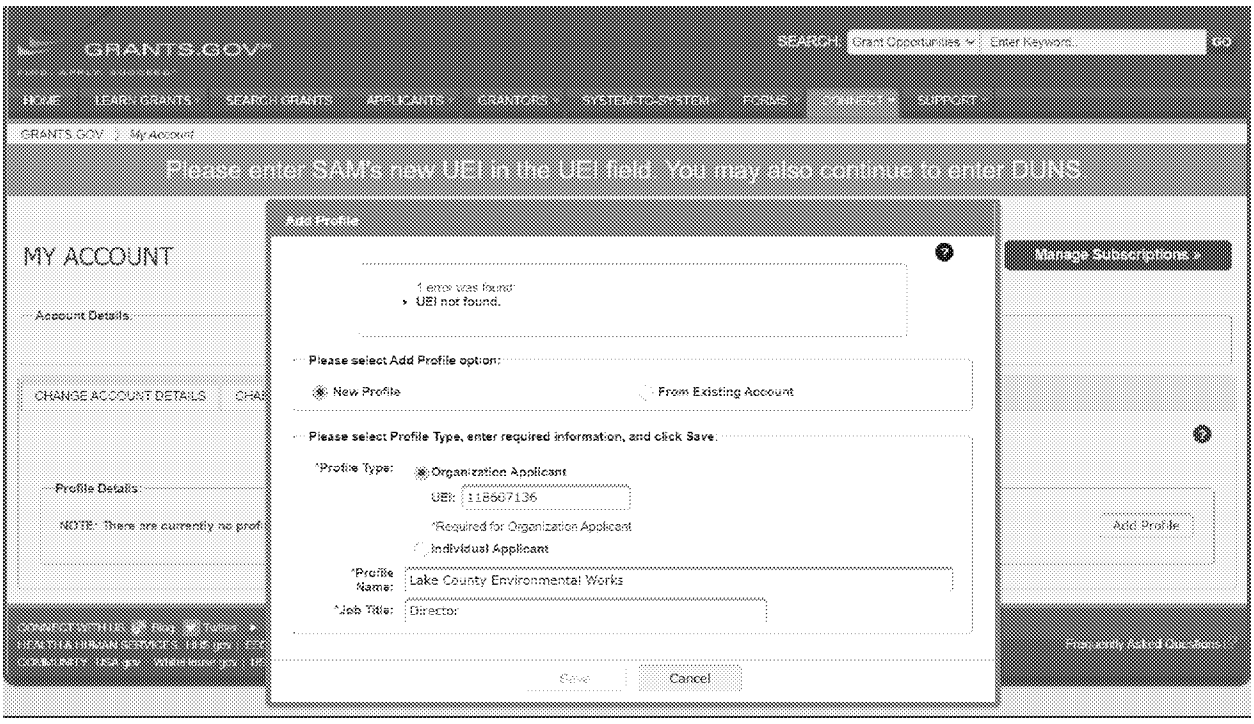
Thank you.

Ref:MSGPROD18691896_jpUYzpjhPQ8LQv

Ms. Tanaka was unable to link her Grants.gov account to the entity. The system could not find the DUNS or SAM IDs. (Refer to screenshots below):


GRANTS.GOV
REGISTER
HOW TO REGISTER & GRANTS.GOV


GRANTS.GOV
SEARCH
Grant Opportunities
Enter Keyword
GO
HOME
SEARCH GRANTS
APPLICANTS
GRANTORS
SYSTEM-TO-SYSTEM
FORMS
PROFILE
SUPPORT
GRANTS.GOV / My Account
Please enter SAM's new UEI in the UEI field. You may also continue to enter DUNS.
MY ACCOUNT
Account Details:
CHANGE ACCOUNT DETAILS
Profile Details:
Add Profile
1 error was found:
UEI not found.
Please select Add Profile option:
New Profile
From Existing Account
Please select Profile Type, enter required information, and click Save.
*Profile Type:
Organization Applicant
UEI:
56HAU593KB79
*Required for Organization Applicant
Individual Applicant
*Profile Name:
Lake County Environmental Works
*Job Title:
Director
Save
Cancel
Manage Subscriptions
Add Profile
Frequently Asked Questions



During the last phone call with FSD, they informed Ms. Tanaka that grants.gov website cannot find the entity unless the SAM registration process completes.

Both opened tickets with FSD are currently elevated to Tier 2 (Aldrin ticket # INC-GSAFSD5884956 and Tanaka ticket # INC-GSAFSD5891361). However, an agent has not been yet assigned to either ticket as of 3/25/2022.

Since we are unable to complete the registration process through SAM.gov, we are also unable to link the entity to Grants.gov account and apply through the system. For this reason, we are submitting our application (and all attachments listed in the Narrative) via email.

We hope to resolve the errors in the SAM system soon.

Thank you in advance for allowing us to submit outside the system.

Respectfully,

Teuta Tanaka

Message

From: January, Elizabeth [January.Elizabeth@epa.gov]
Sent: 5/12/2022 1:14:05 PM
To: Roberts, Timothy-P [Roberts.Timothy-P@epa.gov]
CC: Laursen, Myranda [laursen.myranda@epa.gov]
Subject: FW: Lake County Environmental Works Ticket
Attachments: [JIRA] Updates for IAEREQ-4733: Request Entity Assistance with Registration - Previously submitted INC-GSAFSD5884956 and Tanaka ticket # INC-GSAFSD5891361; [JIRA] Updates for IAEREQ-4733: Request Entity Assistance with Registration - Previously submitted INC-GSAFSD5884956 and Tanaka ticket # INC-GSAFSD5891361

FYI

Elizabeth January
Acting Senior Associate Director for Grants Competition
Office of Grants and Debarment
January.elizabeth@epa.gov
202-564-1584
she/her

From: Brunecz, Michelle <Brunecz.Michelle@epa.gov>
Sent: Wednesday, May 11, 2022 6:49 PM
To: January, Elizabeth <January.Elizabeth@epa.gov>
Subject: RE: Lake County Environmental Works Ticket

FYI . . SEE ATTACHED . . . they are still working this issue.

From: Brunecz, Michelle
Sent: Tuesday, April 12, 2022 8:42 AM
To: January, Elizabeth <January.Elizabeth@epa.gov>
Subject: FW: Lake County Environmental Works Ticket

SAM/IAE Request for Assistance / IAEREQ-4733 IN PROGRESS

Request Entity Assistance with Registration - Previously submitted INC-GSAFSD5884956 and Tanaka ticket # INC-GSAFSD5891361

View issue · Add comment

1 comment

derek wilson on 04/11/2022 08:20

[~marci.eaton] - IAEREQ-4691 and this one appears to be surrounding the same scenario. The problem that was causing them to get hung at the error message that stated "There is an issue with the status of your entity registration" should now be resolved. They have started the registration process from the 'ID Assigned' version and because they couldn't find a match they now have a ticket in with EVS to validate the LBN & Address that was entered. That ticket number is the INC-GSAFSD5929847 ticket if needed.

The cause of the "There is an issue with the status of your entity registration" error message had something to do with a 'draft' record that was showing up in the database but wasn't showing up on the front-end to allow them to take action on.

From: Brunecz, Michelle
Sent: Friday, April 8, 2022 12:03 PM
To: January, Elizabeth <January.Elizabeth@epa.gov>
Subject: RE: Lake County Environmental Works Ticket

From: January, Elizabeth <January.Elizabeth@epa.gov>
Sent: Friday, April 8, 2022 7:30 AM
To: Brunecz, Michelle <Brunecz.Michelle@epa.gov>; Laursen, Myranda <laursen.myranda@epa.gov>
Subject: RE: Lake County Environmental Works Ticket

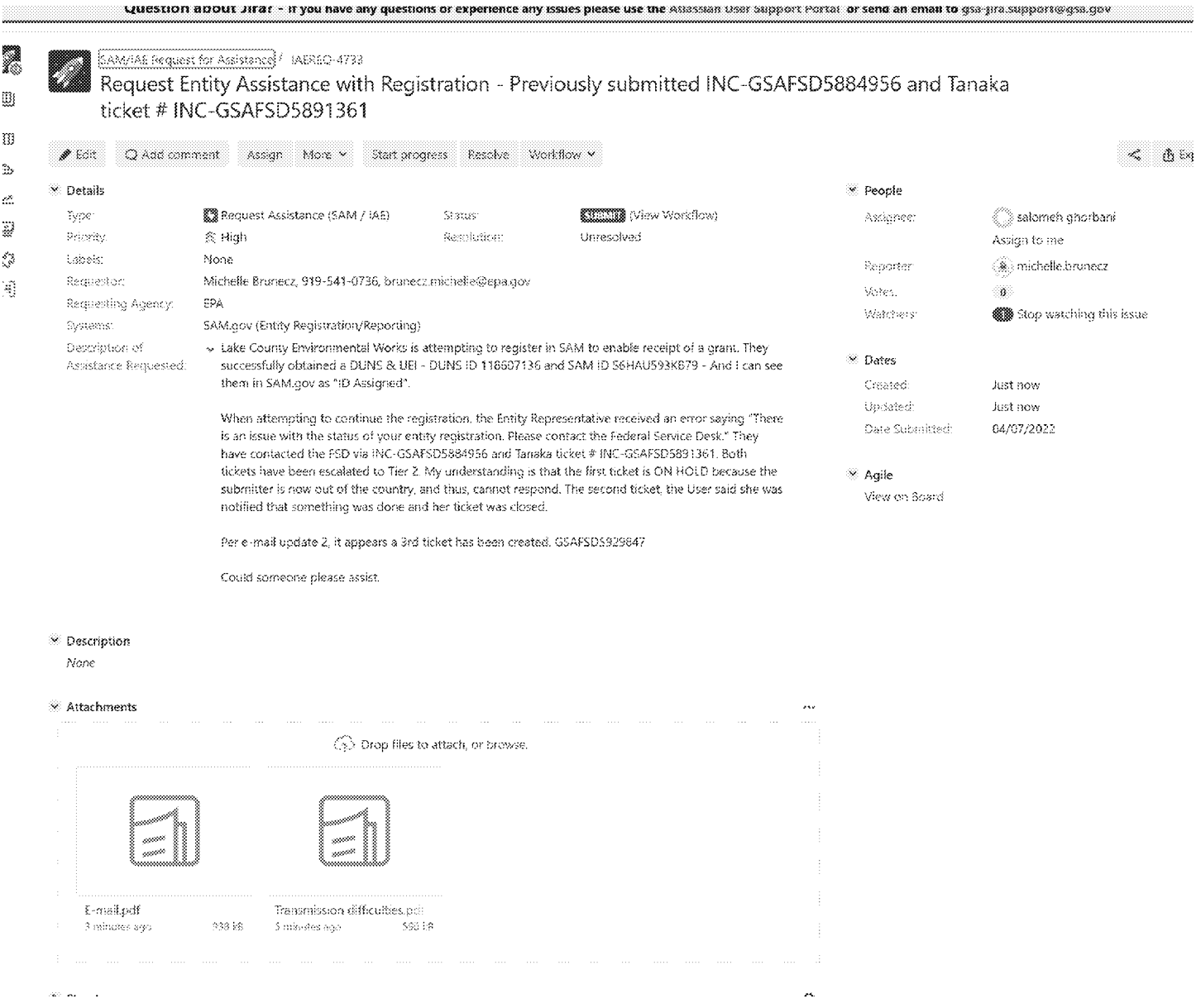
Thank you Michelle!

Elizabeth January
Acting Senior Associate Director for Grants Competition
Office of Grants and Debarment
January.elizabeth@epa.gov
202-564-1584
she/her

From: Brunecz, Michelle <Brunecz.Michelle@epa.gov>
Sent: Thursday, April 7, 2022 5:23 PM
To: Laursen, Myranda <laursen.myranda@epa.gov>

Cc: January, Elizabeth <January.Elizabeth@epa.gov>
Subject: RE: Lake County Environmental Works Ticket

Escalated.



From: Laursen, Myranda <laursen.myranda@epa.gov>
Sent: Thursday, April 7, 2022 3:32 PM
To: Brunecz, Michelle <Brunecz.Michelle@epa.gov>
Cc: January, Elizabeth <January.Elizabeth@epa.gov>
Subject: Lake County Environmental Works Ticket

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Please let me know if you need anything else from us on our end.

Best -

Myranda Laursen
Program Analyst
(she/they)
U.S. Environmental Protection Agency
Office of Grants and Debarment
Email: laursen.myranda@epa.gov
Phone: 202-564-8909

Message

From: derek wilson (Jira) [xcet_support@usa.gov]
Sent: 4/26/2022 6:53:00 PM
To: Brunecz, Michelle [Brunecz.Michelle@epa.gov]
Subject: [JIRA] Updates for IAEREQ-4733: Request Entity Assistance with Registration - Previously submitted INC-GSAFSD5884956 and Tanaka ticket # INC-GSAFSD5891361

There is **1 comment**.

SAM/IAE Request for Assistance / IAEREQ-4733 IN PROGRESS

Request Entity Assistance with Registration - Previously submitted INC-GSAFSD5884956 and Tanaka ticket # INC-GSAFSD5891361

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1 comment

derek wilson on 04/26/2022 14:42

I followed up with John Aldrin who is also working this same registration and now when they try to proceed through the registration process they are getting a 'Something Went Wrong' error message. I am having the MSAM team investigate that now and will follow back up with John as soon as I get an update from the MSAM team.

Message

From: derek wilson (Jira) [xcet_support@usa.gov]
Sent: 5/9/2022 5:47:00 PM
To: Brunecz, Michelle [Brunecz.Michelle@epa.gov]
Subject: [JIRA] Updates for IAEREQ-4733: Request Entity Assistance with Registration - Previously submitted INC-GSAFSD5884956 and Tanaka ticket # INC-GSAFSD5891361

There is **1 comment**.

SAM/IAE Request for Assistance / IAEREQ-4733 IN PROGRESS

Request Entity Assistance with Registration - Previously submitted INC-GSAFSD5884956 and Tanaka ticket # INC-GSAFSD5891361

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1 comment

derek wilson on 05/09/2022 13:36

I still don't see a 'Submitted' version within the site so I called and left a voicemail and sent the customer a follow-up email as well to see if we can be of any further assistance.